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AUTHOR Adams, Diane: And Others
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ABSTRACT

Described is a K-5 curriculum developed by teachers for use in conjunction with an outdoor learning site adjacent to their school. A curriculum matrix depicts the sequence of organisms, habitats, and soil characteristics that students in each grade level should study. Also included is background information about the site for teachers. Organized by grades, each lesson plan includes objectives, a materials list, suggestions for student evaluation, and a brief outline of the activity. Among the learning strategies described are art projects, habitat studies, plays, and plant and animal identification. (WB)

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ENVIRONMENTAL EDUCATION CURRICULUM

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GLEN SPRINGS ELEMENTARY SCHOOL
2826 N. W. 31st Avenue
Gainesville, Florida 32605

SE 032 956

PREFACE

The Glen Springs Elementary Environmental Education Curriculum was developed by the 1975-76 and 1976-77 staffs of the school. The project was partially supported by two State of Florida Environmental Education grants and by Alachua County Public Schools staff development funds. Special assistance was given by Mr. Jim Phillips, Florida Environmental Education Consultant, Mr. Lynn Kilpatrick of the Florida Soil Conservation Service, and Mrs. Donna Strickland, Howard Bishop Middle School teacher.

The need for developing this Environmental Education Curriculum was initially identified by 1974-75 Glen Springs staff members as they sought to implement district teaching objectives for Environmental Education. Staff members observed that the wooded areas of the school campus were ideal for outdoor education learning activities for K-5 students, and began to plan environmental education activities to be implemented in this area.

Methods used to develop the K-5 Glen Springs Environmental Education Curriculum varied. The total staff became involved in planning-workshops. They surveyed the area, identified natural resources, suggested appropriate habitats, selected outdoor teaching sites, and marked proposed nature trails. Children of all grade levels were also involved in planning and developing their own special areas, i.e., rock garden, bird feeding stations, outdoor classrooms, sandpit, etc. Motivating activities for both teachers and students included mulching trails, planting shrubbery, erecting bird-blinds, staking out vegetable garden areas, building a rock garden, etc. (see map on page 7).

Through representative planning all teachers were involved in identifying and developing goals, objectives and materials to be included in the written curriculum. Members of the coordinating committee responsible for organizing and writing the curriculum development were:

Diane Adams	Sally McKnight
Mary Ann Cougdon	Sharon McRae
Ann Foreman	Grace Northrop
Jan Koons	Kathy Vance

In May 1977 the Glen Springs staff commended this group for coorination of the schoolwide project and unanimously adopted the Glen Springs Environmental Education Curriculum for 1977-78 instructional purposes.

Lilly May Shaw, Principal
June 1977

ENVIRONMENTAL EDUCATION CURRICULUM
GLEN SPRINGS ELEMENTARY SCHOOL

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ENVIRONMENTAL EDUCATION CURRICULUM
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PLANT SEQUENCE

PLANTS/HABITATS	Grade Level					
	Kgn	1st	2nd	3rd	4th	5th
1. Pine Flatwoods						
Slash Pine		X				
Wax Myrtle			X			
Gallberry				X		
Blueberry				X		
Stinging Nettle				X		
Sumac					X	
2. Hardwood Hammock						
Live Oak		X				
Poison Oak		X				
Water Oak			X			
Laurel Oak				X		
Magnolia					X	
Hickory						X
Red Oak						X
Sparkle Berry						X
Beauty Berry						X
Smilax						X
3. Sandhill						
Turkey Oak		X				
Wire Grass		X				
Longleaf Pine			X			
Cherokee Bean			X			

	Grade Level					
	Kgn	1st	2nd	3rd	4th	5th
Sandhill (Continued)						
Wild Plum				X		
Bluejack Oak					X	
Gopher Apple					X	
4. Grass Land						
Papaw			X			
Sensitive Briar						X

ANIMALS SEQUENCE

ANIMALS/HABITATS	Grade Level					
	Kgn	1st	2nd	3rd	4th	5th
1. Pine Flatwoods						
Cotton-tail Rabbit	X					
Bobcat		X				
Fox Squirrel		X				
Wild Turkey		X				
Rattlesnake			X			
Deer			X			
Screech Owl			X			
Indigo Snake				X		
Red- cockaded Woodpecker				X		
Black Snake					X	
Raccoon					X	
Opposum						X
Red-cockaded Woodpecker						X
2. Hardwood Hammock						
Bear	X					
Gray Squirrel			X			
Marsh Rabbit				X		
Pileated Woodpecker					X	
Great Horned Owl						X
3. Sandhill						
Gopher Tortoise				X		
Pocket Gopher						X
Flying Squirrel					X	

SOIL SEQUENCE

SOIL	Grade Level					
	Kgn	1st	2nd	3rd	4th	5th
Temperature	X	X				
Texture	X	X				
Layering			X			
Organic Matter				X		
Compactness					X	
Ph (Degree of Acidity)						X

I. HABITATS

The Glen Springs Environmental Education Curriculum is designed to be implemented in both indoor and outdoor teaching areas of the school. The outdoor classroom areas are clearly identified; the curriculum is centered around five modified habitats existing on the school campus. These are:

A. Pine Flatwoods
B. Hardwood Hammock
C. Sandhill
D. Grassland
E. Man-made

This section includes a description of each of these five habitats.

A map of the school campus identifies the location of each modified habitat. See page 7.

A. Pine Flatwoods

Pine flatwoods are dominated by acidic wet sand. Examples of typical vegetation are longleaf and slash pine, palmetto, and wire grass. Examples of animal life include fox squirrel, flying squirrel, and rattlesnake. Such pine flatwoods cover large areas of Florida.

Fire is an important ecological factor in the maintenance of flatwoods. Pines and their associated plants can survive most fires, whereas competing plants are killed by fire. If protected from fire for several years, the pine community gradually become replaced by another community--usually hardwood. The present extent of pine flatwoods is visible indication of the frequency of fire in Florida during past centuries. When the ground is clear and sunlight is plentiful, many small flowering plants come up from roots or seeds following a fire. This makes burned flatwoods a very good place to look for wild flowers.

B. Hardwood Hammock

The word hammock comes from an Indian word meaning "a shady place." Hammocks are dominated by trees and shrubs; thus they provide a shady moist protected environment. They occupy land that is somewhat higher than surrounding terrain.

Hardwood hammocks are dominated by rich soils. Examples of typical vegetation are magnolia, hickory, live oak, and water oak. Animals include gray squirrels, wild turkeys, and barred owls.

C. Sandhill

Sand pine and scrub forests usually grow in excessively drained deep sandy soils. These occur on old dunes or dry sand. A typical sandhill community would have a longleaf or slash pine overstory with an understudy of turkey oak. Common shrubs are gopher apple, runner oak, and papaw. Grasses include bluestem and wiregrass. Typical animals are bobwhite quail, white-tailed deer, fox squirrel, gopher tortoise, and pocket gopher.

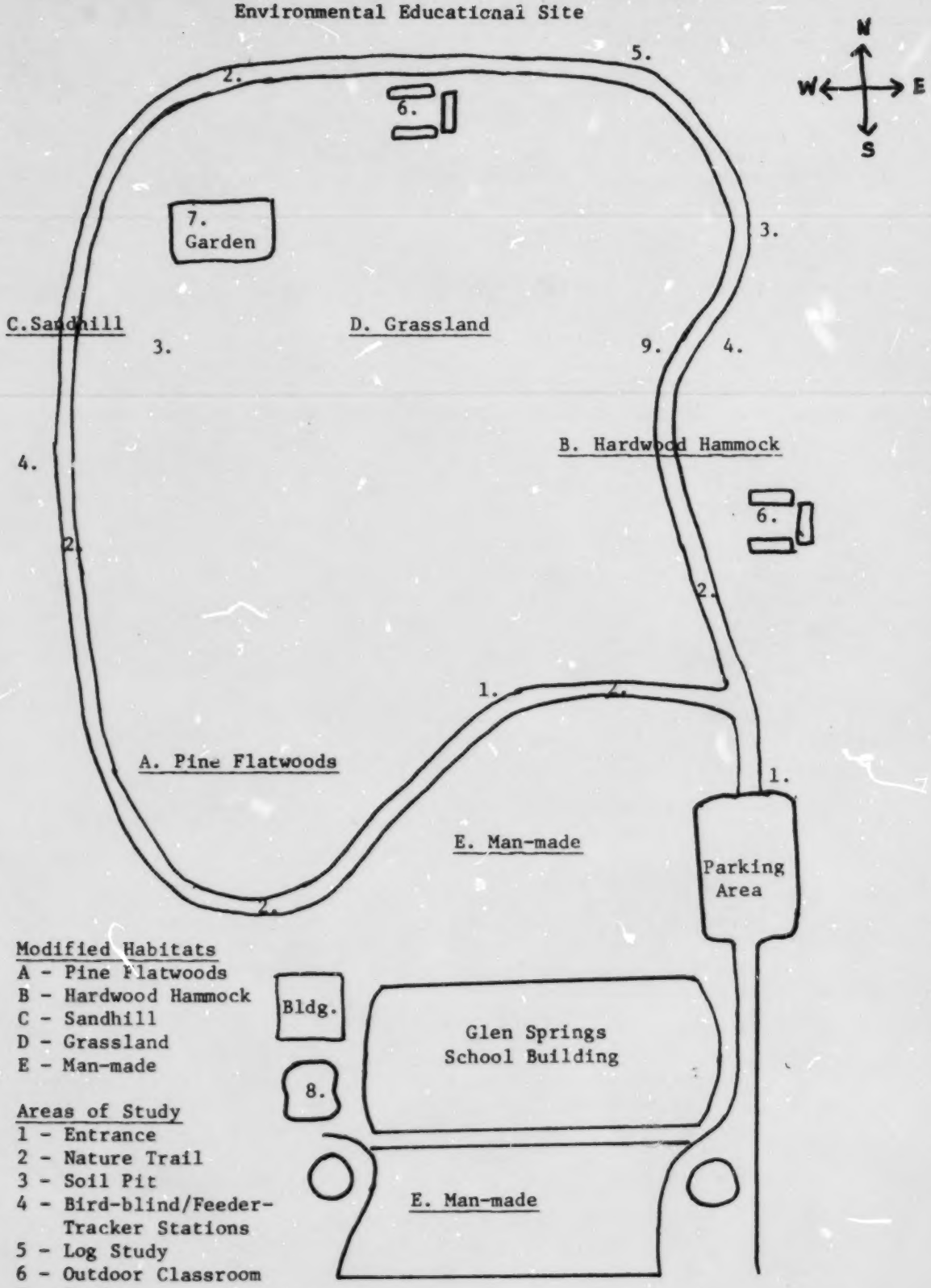
D. Grassland

Grassland vegetation consists of low growing grasses, herbs, and other small plants. Trees and shrubs are usually absent in a grassland because of animal grazing or mechanical cutting. The grassland abounds with many types of insects. Animals from other habitats use the grassland as a food source.

E. Man-made

Areas that have been changed drastically by man are called man-made habitats. On the Glen Springs campus these include: fenced playground area (front), grass (planted and mowed) around building, shrubbery planted flowers, paved driveway, sidewalks, parking lot, playground area in back (challenge course and other equipment).

Environmental Educational Site



Modified Habitats
A - Pine Flatwoods
B - Hardwood Hammock
C - Sandhill
D - Grassland
E - Man-made

Areas of Study
1 - Entrance
2 - Nature Trail
3 - Soil Pit
4 - Bird-blind/Feeder-Tracker Stations
5 - Log Study
6 - Outdoor Classroom
7 - Garden
8 - Rock Garden
9 - Weather Station

II. PLANTS

Each of the five modified habitats located on the Glen Springs campus has specific plants which can live and survive in the specific area. The plants selected for students to study in grades K-5 are described below by correct habitat:

A. Pine Flatwoods

1. Slash Pine

Slash pine is a fast-growing tree common to all parts of Florida. Because of its abundant seed production, it has replaced longleaf pine naturally on large areas protected from fire. Second growth stands of slash pine now form a large part of the pine forests of Florida.

Slash pine and longleaf pine are the two pines that produce crude pine gum for naval stores products. Slash pine is the better gum producer.

Because of its rapid growth, easy propagation, and early yield of timber and crude gum, slash pine promises excellent returns when planted and grown as a crop.

The trunk is straight, clears itself easily of branches, and is crowned with numerous small branches forming a round-topped head.

The needles, which occur in clusters of two or, more often, three in a sheath, are from eight to 12 inches long, dark green, shiny, and thickly-set on the branches, forming a dense head.

The cones are mostly three to six inches long, brown, and glossy or varnished; the thin scales are armed with fine prickles. Slash may best be distinguished from all other pines by these characteristics of its leaves and cones.

The wood is heavy, hard, strong, tough, durable, and very resinous. It is sawed into lumber and sold without discrimination as longleaf pine; and is used for general building and heavy construction purposes, for which it brings good prices.

2. Wax Myrtle

The wax-bearing tree attains a height of forty feet, but in the Everglades region where it forms dense thickets is often only a shrub. It is found generally over the state. As a tree, the trunk is small, and the slender upright or spreading branches form a round-topped head. It is found largely in sandy swamp soils or ponds.

The leaves are broader toward the upper end, pointed, with narrow base, coarsely toothed above the middle, yellow-green above and orange-tinted below from the many small glands, or dots. They vary from one to four inches in length and from one-quarter to one-half inch in width, and are fragrant with a balsam-like odor. The leaves persist till spring.

The flowers are of two kinds growing on separate trees, the female flower growing in close bunches. The fruit is round, about one-eighth inch in diameter light green, and coated with a thick wax which makes a usable candle wax. The "berries" contain a small seed, and grow in close clusters on short stems.

The wood is light in weight, soft, brittle, of a dark brown color, and has no particular use.

3. Gallberry or Inkberry

This two to five foot shrub may be very common in pinelands. It provides excellent shelter for small mammals. Male and female flowers are separate; both are small and inconspicuous. Small black fruits (about one-fourth inch in diameter) give the shrub both of its common names: "gallberry" because of their bitter taste and "inkberry" because of their color. Birds feed on the fruits.

4. Blueberry

From February to June one may find plants of this family in bloom. Its young foliage is usually grayish-green tinged with purple. Blueberries are blue.

Blueberries have small mostly elliptic, short-stalked leaves. Twigs are slender, green, or reddish, and often zigzag, covered with very numerous raised, granular speckles or warts usually visible to the eye, but better seen under a lens. Two types of buds are commonly present, slim leaf buds and swollen flower buds. Though both are small, the tiny bud scales frequently have long tapered tips. The end buds are false. There is one bundle scar per leaf scar. The small, whitish, bell-like blossoms are very ornamental. The blue or black fruits of blueberries contain many small seeds. The fruits are edible and very tasty.

5. Stinging Nettle (Bull Nettle-Spurge Nettle)

The stinging nettle is in the Spurge family along with crotons, castor-bean and poinsettia. It is palmately lobed, with alternate leaves. The entire plant is covered with stinging hairs. It has a white, five petaled flower, located in groups at the end of the stalk. It blooms in March through September. Stinging nettle is found in dry sandy woods and old fields throughout the coastal plan of Florida to Texas and north to Virginia.

6. Sumac

Sumac is a deciduous (loses leaves at end of growing season) shrub three to twelve feet tall. It has pale to deep-green leaves which turn red in the fall; greenish flowers in spikes and clustered fruit (deep red at maturity) are characteristics.

B. Hardwood Hammock

1. Live Oak

The live oak extends from southeastern Virginia through the lower Atlantic and Gulf coastal regions into Texas and Mexico. All of Florida is included except some of the Keys. It is a tree of striking character from its wide-spreading habit, sometimes reaching more than 100 feet in spread, with a short, stout trunk, three to four feet in diameter, dividing in several large limbs with nearly horizontal branches, forming a low, dense, round-topped head. Its height is commonly from 40 to 50 feet. The bark on the trunk and large branches is dark brown tinged with red, and slightly furrowed. It grows to largest size on the rich hammocks and low ridges near the coast and only a few feet above the water level. In very sandy soil it is a tall shrub. It is one of the most desirable trees of the Coastal Plain for road-side and ornamental planting. It is of moderately slow growth but long-lived and handsome.

The leaves are simple, evergreen, thick, leathery, oblong, smooth above, pale and silvery white beneath, and edges slightly rolled under; from two to four inches in length and one to two inches in breadth.

The fruit is an acorn about an inch long and one-third inch wide, borne on a long stem or peduncle; it is oblong, dark brown and lustrous, and set in a top-shaped, downy cup of a light reddish brown color.

The wood is very heavy, hard, strong and tough, light brown or yellow, with nearly white, thin sapwood. It was formerly largely used, and still is occasionally, for ships' knees in building wooden ships.

2. Poison Oak and Poison Ivy

Poison oak usually does not climb as a vine, but occurs as a low-growing shrub with upright growing stems and slender branches covered with fine hairs. The leaflets occur in "threes" as in poison ivy, but are somewhat "lobed" on the general plan of the leaves of some oaks. Poison oak leaves are lighter colored than oak leaves on the underneath side. This is due to the covering of fine hairs.

The fruit of the poison oak is white with a general waxy appearance and has rather distinct lines marking the outer surface. The segments are shapped like segments of a peeled orange.

Poison ivy grows in both shrub form and vine form but more often in the latter. The leaves of the common poison ivy are externally variable, the three leaflets being the most common character. The edges run from smooth to serrated but few are lobed as in poison oak.

3. Water Oak

The water oak is found native in sandy soils, along the borders of swamps and streams, and on bottomlands, over northern and upper contral Florida. When fully grown this tree reaches a height of about 95 feet and a diameter of from one to over three feet. The trunk is shapely.

The bark is smooth, light brown tinged with red, and has many smooth thin scales over the surface. The water oak can be most readily distinguished from the willow oak--a close associate, but longer-lived--by the difference in the general shape and size of the leaves.

The leaves are simple, quite variable in shape, mostly oblong, broader near the point, and narrower at the base, giving a wedge-shaped effect. They are usually three-lobed at the outer end, thin, and of a dull bluish green color, paler below than above, mostly smooth, and usually two to three inches long and one to two inches wide; they remain green for some time and gradually fall from the tree during the winter.

The flowers appear in April when the leaves are beginning to unfold. The fruit, or acorn, matures at the end of the second season. The acorn is from one-half to two-thirds of an inch in length and nearly as broad, light brown or yellowish brown, and often striped, enclosed at the base only in a thin saucer-shaped cup.

The wood is heavy, hard, strong, light brown in color, with lighter-colored sapwood. It is not used to a great extent as lumber, but the trees are cut and utilized for piling, crossties and fuel.

4. Laurel Oak

The laurel oak is one of the more common and the most beautiful of all the oaks. It is generally distributed and found on the banks of streams and in or near swamps and rich hammocks over the state except in the extreme southern portion.

It is a large tree, reaching a height of 100 feet and a diameter of three to four feet, with slender branches forming a broad, dense, round-topped, shapely crown. It has been extensively planted as a shade and street tree.

The bark of young trees is dark brown, more or less tinged with red, roughened by small close scales, becoming on older trees nearly black and broken into broad flat ridges.

The leaves are from two to six inches long and three-quarters to over an inch wide. They bear the same general resemblance to the laurel that the willow oak does to the willow, and should not be confused with this latter tree because of their greater width in proportion to their length. They are thin and very shiny above, lighter green below and with less gloss. They fall during the early part of the spring and for a few weeks the trees are bare. The tree may be distinguished from the live oak, which it somewhat resembles, by the absence of gray down or fuzz on the under side of the leaves.

The flowers which appear early are distinctly red.

The acorn, which matures at the end of the second year, is dark brown in color and about half an inch long. It is enclosed for about a fourth of its length by a thin saucer-shaped cup covered by thin, light red-brown scales.

The wood is heavy, hard, and coarse-grained. It checks in drying and is used only for fuel.

5. Magnolia

The magnolia, or evergreen magnolia, is one of the well-known trees in the state. No other in our forest excels it in the combined beauty of the leaves and the flowers. Occurring naturally in the rich hammock soils and on the border of river swamps and pine-barren ponds, it has been widely cultivated for its ornamental value. In its natural habitat, it attains heights generally of 60 to 80 feet and diameters of the trunk up to four feet. The dense pyramidal head, or crown, is made up of numerous small spreading branches and branchlets. Its range is over the state as far south in the peninsula as DeSoto County.

The bark is gray to light brown. The leaves are evergreen, thick, leathery, elliptical or oval, dark green and shiny above, rusty or silvery beneath, and mostly from five to eight inches long and two to three inches wide, with prominent midribs. They remain on the tree for about two years.

The large handsome flowers appear at intervals during the summer. They are very attractive with their large pure white petals surrounding a splash of bright purple in the center (from the stamens) and their pleasing fragrance. The "sweet magnolia" of the South well deserves the place given it in story and song. The fruit consists of a rounded or oval head from three to four inches long containing many seed, each enclosed in a sheath. These open and display the bright red "berries" dangling on slender threads.

The wood is moderately heavy and hard, and of a creamy color. It is used somewhat for ornamental purposes, and considerably as firewood.

6. Hickory

The white hickory, whiteheart, mockernut, or big-bud hickory is common on rich well-drained soils over northern Florida. It is a tall, short-limbed tree averaging 60 feet high and one to two feet in diameter.

The bark is dark gray, hard, close and deeply furrowed, often apparently cross-furrowed or netted. The winter buds are large, round or broadly egg-shaped, and covered with downy, hard scales. The recent shoots are short, stout, and more or less covered with a down growth.

The leaves are large, strong-scented and hairy, composed of seven to nine obovate to oblong, pointed leaflets which turn a beautiful yellow in the fall.

The flowers, like those of all other hickories, are of two kinds on the same tree; the male in three branched catkins, the female in clusters of two to five. The fruit is oval, nearly round or slightly pear-shaped with a thick, strong-scented husk which splits nearly to the base when ripe. The nut is of various forms, but is sometimes four-to six-ridged, light brown, and has a very thick shell and small, sweet kernel.

The wood is heavy, hard, tough and strong; it is white excepting the comparatively small, dark-brown heart, hence the name white hickory. It is used for vehicle parts, handles and picker sticks. It furnishes the best of fuel. This and the other hickories are desirable both for forest and shade trees.

7. Red Oak

The red oak has deciduous leaves, five to nine inches long, with three to seven lobes deeply separated by rounded sinuses. The central (terminal) lobe is considerably longer than the others, and quite narrow by comparison. Acorns are rounded, with a scaly cup that covers about one-third of the fruit. Red oak is an upland tree occuring on dry ridge-tops and slopes facing south and west. It is usually on dry, sandy, or clay soils. Leaves have little sharp bristles on their points. Acorns take two years to form, taste bitter and are not good to eat. Bark is dark brown, rough, full of little high-places.

Red oak is used for furniture, flooring, veneer, many other products. Acorns are valuable as wildlife food. Trees are decorative and shady.

8. Sparkle Berry

The sparkle berry is very ornamental in bloom resembling a lily-of-the-valley. In southern Florida the leaves are evergreen. Flowers are white, bell-shaped, and small in leafy bunches. Berries are black and shining. Sparkle berry can be a shrub or small tree. Leaves are oval or broadened upward, one-half inches long. It is found in dry woods in the spring from Florida to Texas and Virginia.

9. Beauty Berry (French Mulberry)

This slender shrub is most conspicuous in autumn and early winter when the pale flower-clusters of spring have given place to shining violet or purple berries. The berries are a favorite food of mockingbirds. The flowers are lavender or bluish, small, four lobed; they grow in clusters. There are four stamens. The fruit is small and violet. The shrub stands three to seven feet tall. The leaves are opposite, oval or broadset below middle, toothed, stalked, three to six inches long. It is found in woods and thickets in the spring and summer.

10. Smilax (Bamboo Briar, Greenbriar)

Climbing over wayside thickets, and on tall trees in the swamps, forming barriers of prickly stems bearing shining leaves and clusters of red on black berries, these plants are abundant in many places, and are known by many names. As "catbriars" they scratch; as "squirrel-briars" they climbs; "bullbriar" and "horsebriar" are old names given to species of stout growth.

Although allied to the lilies, the beauty of smilax is not in its flowers but in its luxuriant foliage. Great variation is shown in the leaf-form in vines of the same species and even in the leaves of one vine. Our largest smilax, the evergreen, bears conspicuous clusters of berries that do not mature until the second year. These flowers perfume the air in the

spring. Unarmed stems of the trailing smilax (which has orange-yellow berries) lie on the ground in shaded places.

Indians prepared a strachy food from the tuberous rootstocks of certain species of smilax. There are six species common to Florida.

C. Sandhill

1. Turkey Oak

This oak is one of the characteristic trees associated with the pines over all of northern Florida and some distance into the Peninsula. It is abundant and reaches good size on dry sandy ridges and sandy bluffs and hammocks in the coast region. It is usually 20 to 30 feet high, but rarely reaches a height of 60 feet, with a trunk a foot and a half to two feet in diameter. Its branches are stout, spreading and more or less contorted, forming an open irregular but generally round-topped crown.

The leaves are deeply divided into three, or five, or rarely seven lobes, spreading and tapering from the base, and average about five inches long as well as wide. They are thick and rigid, heavily veined, bright yellow-green and lustrous above, paler and somewhat downy on the undersurface. They are very characteristic and should not be confused with those of any other tree.

The acorn is short-stalked, dull, light brown in color, an inch long and three-fourths of an inch broad. It is oval for shape, full and rounded at both ends, and is enclosed for about a third of its length in a thin, light red-brown cup covered by rounded scales that extend above the rim of the cup and down over part of the inner surface.

The wood is heavy, hard, strong, rather close-grained and light brown in color, tinged with red. It is used largely for fuel, but is cut to some extent for lumber and used for general construction.

2. Wire Grass

Wire grass grows in a thick bunch form, with many long, drooping, brownish-green wire-like leaves.

It is normally found in sandhill and dry flatwood areas.

3. Longleaf Pine

The young longleaf pine forms one of the most striking features of southern forests. When five to ten years of age, the single upright stem with its long, dark, shiny needles, forms a handsome plume of sparking green; while in later youth the stalwart, sparingly branched sapling, with its heavy twigs and gray bark, attracts immediate attention. The older trees have tall, straight trunks, mostly one to two feet in diameter, and open, irregular crowns, one-third to one-half the length of the tree.

Longleaf pine is found throughout the Sate, except for the southern tip of the peninsula. Longleaf pine stands today reflect a history of extensive naval stores operations, logging, and burning following the logging. As a result many longleaf pine forests have been replaced by other species.

The leaves or needles are from ten to fifteen inches long, in clusters of three, and gathered towards the ends of the thick, scaly twigs. The flowers, appearing in early spring before the new needles, are a deep rose-purple turning to silver-white. The male flowers grow in prominent, short, dense clusters, and the female flowers in inconspicuous groups of two to four.

The cones or burrs, are six to ten inches long, slightly curved, the thick scales armed with small curved prickles. The cones usually fall soon after the seeds ripen, leaving their bases attached to the twigs.

The wood is heavy, hard, strong, tough, and durable. Known as yellow pine, pitch pine, and southern pine, it is used for all kinds of building and other construction. Naval stores, consisting of tar, pitch, rosin, and turpentine, are obtained from this tree and its close relative, the slash pine, by bleeding the trees for their gum.

4. Cherokee Bean (Coral Bean)

The cherokee bean is a relative of the coral tree of India. It has red flowers that flame from thickets or rise among low palmettos during late winter and spring.

The long bunches often begin to bloom before the leaves appear. The bloom is also red and almost conceals the small petals. The seedpods which are constricted between the seeds, open in summer and display bright scarlet beans.

This species is poisonous and should not be handled or, if so, very carefully. Pod or bean should never be cracked.

Flowers are red, narrow and nearly two inches long in long bunches. Stems are two to six feet tall, usually prickly. Leaves are long-stalked leaflets; the three triangular leaves are one to three inches long. It grows in sandy soil.

5. Wild Plum

The common wild plum is a small tree of western Florida, which at a height usually of three to six feet divides into many spreading branches, often drooping at the ends. Not uncommonly it grows in thickets where it attains only large shrub size. The value of the tree lies in its fruit from which jelly and preserves are made; and its handsome form and foliage, pure white fragrant flowers, and showy fruit which make it desirable for ornamental planting. Several other species of plums or cherries are native.

The leaves are alternate, oval, pointed, sharply toothed (often doubly toothed) along the margin, thick and firm, three to four inches long by one to two inches wide, narrowed or rounded at the base, and prominently veined on both surfaces.

The flowers appear in numerous small clusters before or simultaneously with the leaves, and are white with small bright red portions in the center. With a profusion of flowers, this tree is one of the delights of

early spring in the woods. The fruit, or plum, which ripens in late summer, is red or orange colored, about an inch in diameter, contains a stone or pit that is flattened and about as long as the pulpy part, and varies rather widely in its palatability. Horticulturists have selected and improved certain strains for cultivation.

The wood is heavy, hard, close-grained, reddish brown in color and has no special commercial uses.

6. Bluejack Oak

The name by which this small, inferior, but abundant oak is known varies widely. Some know it only as "turkey" oak, others "blue jack", while the best name for the whole coastal plain seems to be upland willow oak.

It is found all over the state as far south as the Everglades, growing on sandy barrens and sandy ridges. One of its most common tree associates is the true turkey oak (often called "black jack"). The tree is usually not over fifteen to twenty feet in height by six inches in diameter.

The leaves are narrowly oblong, thick, firm in texture, from two to five inches in length and up to one and one-half inches in width, smooth on the edges, pale bluish green above, and gray and wooley beneath. The leaves should help to distinguish the tree from all other oaks. The leaves drop off in the autumn.

The fruit is an acorn, produced in abundance over the tree. It is oval, about one-half inch long, striped with dark bands vertically, downy on the surface, enclosed for less than one-half its length in a thin, rather flat "saucer."

The wood is hard, strong, close-grained, reddish brown, and is little used.

7. Gopher Apple

Gopher apple's spreading underground stems enable this dwarf shrub to grow in patches covering large areas of ground. It is three to twelve inches tall. The small white to yellowish flowers grow in clusters at the ends of branches. The oblong white fruits are approximately one and one-half inches. They have a thin layer of sweet pulp and one large seed. Many kinds of animals (including gopher turtles) feed on the fruits which are also edible for humans. These plants are excellent sand-binding ground covers for dry sunny locations. They grow slowly and require no mowing.

D. Grassland

1. Papaw

Papaw is a small tree or shrub native to North America. The tree produces a fruit also called papaw that looks somewhat like a thick short

banana. The plant is found in the southern United States and as far north as Kansas, Michigan, New Jersey, and western New York. Its leaves spread out in umbrella-like whirls, similar to the magnolia species. When the leaves are bruised they give off a foul odor.

The papaw grows to a height of from ten to forty feet and bears fruit two to six inches long. The fruit has a greenish-brown skin. The yellow pulp is soft and sweet, but isn't tasty enough to make it a popular table fruit. The wood of the tree is too soft and coarse to be valuable. The thick fibrous bark may be used in making fish nets.

2. Sensitive Briar

The sensitive briar trails richly colored green and bronze leaves and stems over the ground, opens dainty heads of delicately scented pink flowers, and at night folds its tiny leaflets in so-called sleep. Touch a stem, and every leaflet along its prickly length droops at once. So sudden is the movement, and so strange, that it was once fancied to be a protective device by which insets and animals would be frightened away. Such theories, though tempting to a facile imagination, are of doubtful value.

The flowers, like others of this family depend on the long stamens for display. The flowers are so densely crowded together that the heads appear as balls of delicate pink stamens. The perennial root is thick and heavy.

III. ANIMALS

Each of the five modified habitats located on the Glen Springs campus has specific animals that live and survive in these areas. The animals selected for K-5 students to study are described below by correct habitat.

A. Pine Flatwoods

1. Cottontail Rabbit

Identification: The Eastern cottontail and the marsh rabbit live in Florida. Rabbits are distinguished by their soft fur, long ears, and short tail. The cottontail is grayish-brown in color and has a distinctive white "powder puff" tail. It may be from 14 to 17 inches in length and weigh from two to four pounds. The marsh rabbit is slightly smaller, darker brown, and has hair coarser than the cottontail. It has a small inconspicuous tail that is dingy white on the underside, and will often walk rather than hopping as most rabbits do.

Range: The cottontail rabbit prefers a habitat of heavy brush, strips of forest, weed and briar patches, abandoned fields and fringe areas of cultivated fields. Periods of peak activity for cottontails occur in early morning and at night. Marsh rabbits utilize wet-bottom lands, swamps, marshes and hammocks. Marsh rabbits move about much more during daylight than the cottontail.

Reproduction: Breeding season is nearly year-round, but mainly February through September. The young are born from March through September. Rabbits have a gestation period of 26 to 30 days. In a single year a female may have three to four litters with from four to seven young. Rabbits nest on the ground and the young are born with eyes closed.

Food: Rabbits are strictly vegetarians. Their main course of food during warmer months is green plant parts. The marsh rabbits will also eat rhizomes and bulbs. When green vegetation is not available, rabbits will eat twigs and bark.

2. Bobcat

Identification: The bobcat is considered by some as the most beautiful and most lethal wild mammal in Florida. It is equipped with razor-sharp claws, needle-like teeth, and the strength to make good use of these weapons. The name, of course, is from the short, stub-like tail which is approximately five inches long, and with a distinctive black tip on the top. Coloration of the bobcat may vary, but generally is tawny-brown and spotted with brown on the back and sides. The underparts are yellowish-white, spotted with black. Legs are spotted on the outside and barred with black on the inside. The bobcat may measure up to three feet, including the tail, and weigh from 15 to 30 pounds, The bobcat is an excellent climber and his voice is typically catlike.

Range: Widely distributed throughout most of North America, this cat has adapted well to civilization and is found throughout Florida. The

bobcat is equally at home in deep forest, swamps and hammock land. A bobcat may have a normal range of five or six miles and generally cover its territory in a slow, careful process.

Reproduction: The female bobcat may breed after one year, and this generally takes place in late winter or early spring. One to four young are born after a gestation period of 50 to 60 days. Two to four young make a normal litter, and the newborn "kits" have full coats of spotted fur, but their eyes do not open until they are nine days old. The young are weaned in about two months. The young are taught hunting skills by their parents.

Food: An extremely efficient hunter, the bobcat, like all felines, hunts by sight and usually at night. The bobcat feeds on a varied diet of birds and small mammals, and will occasionally kill a white-tailed deer. Vegetable food is rarely consumed, however, the bobcat is seldom confronted with a food shortage because of their highly varied diet. Only the very young are subject to predation of larger mammal and bird predators, and such takes place only in the mother's absence.

3. Fox Squirrel

Identification: The fox squirrel is a large tree squirrel weighing from one to three pounds. It may have some color variations which range from a buff color to gray, and in some instances black. The buff color phase is probably predominant in Florida. The underparts are usually lighter, and typical specimens have white noses and black faces and feet. All squirrels are rodents of widely distributed families of tree-dwelling animals. They are noted for their long, bushy tails and for their strong hind legs which allows them to leap easily from place to place. The fox squirrel has 20 teeth. Gray squirrels have 22 teeth. The fox squirrel probably was named after the fox because of its comparatively large body size and peculiar way of running along the ground which gives the appearance of a small fox. Compared to the gray squirrel, the fox squirrel is slow and awkward in its movements.

Range: The fox squirrel may be found throughout Florida. Preferred habitat is open woods, pine, cypress stands, and mangrove swamps. According to some scientific reports, the fox squirrel is found in two forms: the north Florida form is found in suitable open piney wood type habitat of central and northern Florida. The other form is found in south Florida from the region of the Everglades, Lee County, to the southern part of Dade County.

Reproduction: Mating occurs in late winter and midsummer. Females breed when they are about one year old. Yearling females have one litter and older females produce two litters each year. Gestation period is approximately 44 days; the young per litter may vary from one to five, usually two or three. Young are weaned at two to three months. The nest is usually located in tree cavities or may be in a leaf nest.

Food: The diet of the fox squirrel consists primarily of plant material such as nuts, seeds, fungi, fruit and buds. Pine seed is their favorite. They are known to occasionally eat animal materials such as insects and bird eggs.

4. Florida Wild Turkey

Identification: The wild turkey is similar to domestic turkeys but is much more wary. The tail feathers of the wild turkey are tipped with a dark brown, as compared to the white of domesticated birds. The head of a wild turkey is long, sleek and narrow with considerably less wattling than a domestic turkey, and the legs are thinner and appear to be more of a coral color than the legs of the domestic species.

Range: The wild turkey is found throughout Florida, but is scarce in the everglades. Suitable woodland habitat includes a mixture of woods or swamps that provide food, roosting areas and escape cover and properly dispersed grasslands that provide nesting sites and food during spring and summer.

Reproduction: Mating activity begins in early March, however, some activity has been noted in mid-February, depending on the weather. Approximately two weeks after breeding the hen begins laying her eggs. The average clutch is from eight to eleven eggs and requires an incubation of 27 days. The gobbler takes no part in the nesting and rearing of the young. Young turkeys or "poults" are unable to fly for about ten days during which the most severe rate of natural mortality takes place.

Food: Wild turkey will consume almost anything that is edible. Especially important, during the winter, are acorns, palmetto berries and other seeds. During the summer, grass seeds, leaves, berries and insects provide the major portion of the regular diet. On a year-round basis, grass seeds are probably the most important single food item. There are local exceptions depending on food supply.

5. Diamondback Rattlesnake

Identification: The eastern diamondback rattlesnake of Florida is the largest and most dangerous of all poisonous snakes native to North America. It should never be molested or handled when encountered. The diamondbacks are recognized by the distinctive pattern of yellow-bordered diamond-shape markings on the back. The tail ends in a rattling mechanism of brittle, button-shaped horny growth. The arrow-shaped head is much wider than the neck.

Range: The diamondback rattlesnake is found in every county and many coastal islands and Keys. They are most commonly found in areas of palmetto flatlands, pine woods, abandoned fields, and in brushy, treed, or grassy areas.

Reproduction: The rattlesnake gives live birth to from nine to fifteen young at a time. The young carry poison at birth.

Food: The diamondback rattlesnake likes to eat warm-blooded animals such as rabbits, gophers, rats, mice, and other small mammals.

6. Florida Deer

Identification: The Florida deer is the same white-tailed deer found throughout North America. The adult is from three to three and one-half

feet at the shoulder and weighs from 50 to 300 pounds. The smallest race, the key deer, weigh less than 50 pounds and are found only in the Florida Keys. Adults may be reddish-brown in summer and change to blue-gray in winter. The underside of the tail is white, and when disturbed the tail is held erect, displaying the famous "white flag". Only bucks have antlers which are shed after the breeding season to be replaced with new antlers each year. The number of points or antler size is no indication of age, but may serve as some indication of range quality. Young deer, or fawns, have white spots on a reddish coat. Though deer are normally silent, a snort or woof may be given when startled, or may be sounded by does as a signal for fawns.

Range: White-tailed deer are found throughout Florida. Preferred habitat includes the edges of forest, swamp and fields. Some of the best range includes an abundance of young undergrowth in a forest area. The home range of an individual may be as much as one mile across, though usually less.

Reproduction: The breeding season (rut) ranges from early fall in South Florida to late winter in North Florida. Gestation period is from 190 to 200 days, and young are born from April to August. The birth rate (single or twins) may be determined by the condition of the deer herd and quality of deer range. Fawns are nursed for four months and may follow the doe for one year.

Food: Deer are browsers and grazers. Research indicates that 85% of the diet consists of plant leaves, acorns, palmetto berries, mushrooms, ferns and briars. Deer also eat grasses and some cultivated crops.

7. Screech Owl

Identification: This is the common small barred owl of towns, orchards, and small woodlots. Its plumage is bright rusty, brown, or gray. This little owl is about eight inches long and has a wingspread of about 22 inches.

Range and Habitat: The screech owl occurs commonly throughout Florida except in the interior of the Everglades and the coastal mangrove forests.

Reproduction: The screech owl nests in tree cavities or woodpecker nesting holes. It will readily use wood duck nesting boxes. Usually four-five eggs are laid during late spring. Incubation by the female takes around 26 days. The male is usually close by the next cavity during the day. He will hunt for the female at night. The young are ready to leave the nest at about 28-30 days.

Food: These owls will consume almost any available form of animal life from worms to small mammals; when mice are abundant, its diet includes many rodents. When small birds are numerous, many are captured.

8. Indigo Snake

Identification: Indigo snakes eight feet long have been reported; thus they are among the largest North American snakes. The indigo snake tames

easily in captivity and does well if it can be made to eat. This is the harmless snake that snake charmers at the circus often handle.

Range and Habitat: The indigo snake is found in high pineland in North and Central America. It is often found in burrows of gophers or rabbits.

Reproduction: Usually five to twelve eggs are laid in May and hatch in August or September. Indigo snakes are 18-24 inches in length at birth.

Food: This heavy, handsome, shiny, midnight blue snake feeds on small mammals (rabbits, rats, mice) and other snakes.

9. Red-shouldered Hawk

Identification: The red-shouldered hawk has reddish shoulder patches, uniformly colored underparts, and narrow white bands on the dark tail. Its call is often imitated by blue jays.

Range and Habitat: The red-shouldered hawk is one of the most common hawks of eastern North America, breeding in most woodlands, often close to cultivated fields.

Reproduction: Nests are placed in trees (cypress, pine, oak) 18-75 feet above the ground. A favorite location is on borders of a swamp, but the nests are also found in open pine woods and oak hammocks. Eggs (two to three) are dull white with splashes of brown.

Food: They often hunt from a perch for rodents, insects, and small birds.

10. Black Racer

Identification: The black racer is a large snake that is uniformly bluish or black (above or below) with smooth satin lustrous scales. The body is large (up to 78 inches) and slender. It has a very long tail, and its throat and chin are white. This snake is fast, agile, and will fight when cornered. It is not poisonous.

Range and Habitat: The black racer can be found in open fields, forest borders or fence-row thickets throughout the southeast coastal plain.

Reproduction: Eggs are coated with nodules.

Food: The black racer eats warm-blooded animals. These include small birds and mammals. They also eat other reptiles and amphibians.

11. Raccoon

Identification: A more All-American animal than the raccoon is hard to find. It lives in every one of the lower 48 states. Its fur has furnished such legendary items as the coonskin cap of the frontiersman and the

overcoat popularized by college boys in the 1920's. Their under fur is brown. The long coarse hairs forming the outermost layer are grayish with black tips. A black nose and mask about the eyes contrast with a white face. The tail is yellow-gray with five to ten black rings. Albino raccoons are not uncommon. Raccoons are about 32 inches long, nose to tip of bushy tail. The tail accounts for ten inches of the total length. At the shoulder, the animal is a foot high. It weighs about 20 pounds, though some have reached 40 pounds or more.

Range and Habitat: The raccoon is a lover of the woods and wet areas. His choice of homes is a hollow tree but he will also live in woodchuck dens, caves, mine shafts, barns, garages. One Texas raccoon lived in a nail keg fastened to a tree and designed as a home for wood ducks. The tree stood in water and the raccoon had to swim to get home, or to leave it.

Reproduction: Raccoons breed in January, February or March. Two to seven young make up a litter. They are born blind and weigh about 2-1/2 ounces each. The mother rears the family; the father is absent. If he were to appear, the mother probably would drive him off, because males sometimes eat the young. After three weeks the babies' eyes open. At three months the young have grown to two pounds or more in weight. They follow the mother on her nightly prowls for food and it is not long before they learn to catch their own prey.

Food: These animals like the nighttime. That's when they leave their dens to find food. They visit a stream's edge and search the shallow pools for crayfish, their fondest delicacy. The same areas may yield mussels, snails, frogs or fish. Other foods on the raccoon menu include earthworms, grubs, crickets, bird and turtle eggs, mice, berries, grapes, corn, melons, acorns, apples--the list is long. Their diet leans in favor of vegetable matter over meat.

12. Opossum

Identification: Opossums are about the size of a house cat, but with heavier body and shorter legs, spreading toes, long pointed nose, white face, paper-thin black ears, rat-like tail and gray fur.

Range and Habitat: Opossums live in pine flatwoods. They also prefer to live near farming areas.

Reproduction: Due to the opossum's peculiar anatomical construction and the difficulty of observing intimate details of his life, misconceptions are prevalent regarding his method of reproduction. Mating occurs as with most other mammals, and the young are born 12 or 13 days later in the usual manner. The babies are extremely small at birth (about the size of a pea) and weigh about 1/10,000 as much as the mother. Immediately after birth they make their way unassisted to the mother's pouch where they attach themselves to a teat. They remain attached for approximately two months and milk is pumped into the young by muscles around the mother's teats. The babies stay with their mother for about 3-1/2 months. Opossums generally bear two litters a year and the number of young varies from 3 to 14.

13. Red-cockaded Woodpecker (Sapsucker)

Identification: The red-cockaded woodpecker is a small (eight inch) bird recognized by its barred back, black cap and a large conspicuous white cheek patch. Males have a small red patch near the ear (the cockade), but this is seldom seen in the field. Fledgling males have a red crown patch which is lost after their first molt. One of the best ways to find this species is to learn its call notes (e.g. "Szrek") because when a clan is active, they frequently call back and forth.

Range: The geographic distribution of the red-cockaded woodpecker, both historically and at present, is primarily coastal plane pinewoods of the southeastern United States. This coincides with the natural range of several species of southern pines (especially longleaf pine from southeastern Virginia to eastern Texas. Some of its range extends into the Piedmont and rarely into the mountains (e.g. Cumberland Plateau of Kentucky and Tennessee). Presently, South Carolina, Georgia, and Florida are believed to have the highest populations of this species. Historically the red-cockaded woodpecker has been found throughout Florida, south to the Homestead area. Presently it is found throughout much of the state, being common in some areas of the north and rare in the south.

Reproduction: The red-cockaded woodpecker nests in living pine tre 20-70 feet above ground. Eggs (three to four) are laid in the spring.

Food: This woodpecker eats insect larvae (particularly of wood-bo insects), ants, various spiders and caterpillars, and an occasional wild fruit or berry.

B. Hardwood Hammock

1. Bear

Identification: The black bear is five to six feet in height and weighs up to five hundred pounds. The female bears are smaller. The black bear has a tan-colored nose and jaw, and a white patch on the throat.

Range: Black bears usually remain within fifteen miles of their birth place. They are found throughout Florida.

Reproduction: The female has a litter of one to four cubs. They are full-grown in four years.

Food: The bear is omnivorous. They eat fruit as well as vegetables.

2. Gray Squirrel

Identification: The gray squirrel is a furry-tailed animal with large black eyes and rounded ears. Many are lively animals with long bushy tails. Eastern gray squirrels are 16-24 inches long including tails. They weigh 3/4 to 1-1/2 pounds and have gray fur on their backs and whitish fur on their underparts.

Habitat: Many squirrels have two homes--a temporary one cool enough for hot days and a permanent one that is warm. It could be a den in a hollow tree trunk or a nest built on a branch. They make their nests by layering twigs and leaves packed together tightly. These nests are usually lined with dry leaves and strips of bark. In winter several squirrels may share one nest or den.

Reproduction: The gestation period is 44 days; the number of young is two to five; life span in captivity is 8-15 years. The female squirrel carries her young in her body 36-45 days. She gives birth an average of twice a year; usually two to six young are born at a time. Newborns have no fur and their eyes are closed. Gray squirrels open their eyes in approximately 37 days. Within five to eight weeks fur is present and the young begin to look for their own food. They begin to reproduce at about one year old.

Food: Squirrels eat berries, corn, fruits, nuts, mushrooms and seeds. Much time is spent looking for food, especially in autumn. Food is stored up in holes in the ground, in trees, or in their dens.

3. Marsh Rabbit

See Cottontail Rabbit, Pine Flatwoods, page 18.

4. Pileated Woodpecker

Identification: A solid black back distinguishes the pileated woodpecker from other large birds except crows and some hawks. It is conspicuously crested in all plumages. Flight is strong with irregular flaps of the wings. Drumming is loud, slow, softer at the end. Its call is a series, never single. It is about fifteen inches long.

Range and Habitat: This woodpecker is found in all forested communities in the southeastern United States from North Carolina to Florida. Cypress, pine, black gum, oak, cabbage palm, and palmetto are preferred by the pileated woodpecker.

Reproduction: Eggs (three to five) are laid from March to May. Eggs are white in nests from 12-75 feet above the ground.

Food: This woodpecker prefers the following plants for food: cherries, crabapples, dogwoods, elderberries, acorns. They also eat beetles, ants, and other insects.

5. Great Horned Owl

Identification: Florida's largest owl reaches body length of 18 to 25 inches and attains wingspreads of 4-1/2 feet. Coloration is generally brown, spotted with darker browns and black both above and on the wing. It is light below, rather finely carped with dark brown or black. The underbreast, or bib, is whitish or light-colored, the eye disks are reddish. There are prominant ear tufts and the eyes are bright yellow. The voice of

this great owl is one of its outstanding traits. It is a "hoot" owl indeed. Deep and resonant, the notes have much carrying power.

Range and Habitat: This species occurs commonly in the Americas from the northern tree line to the Strait of Magellan except for the West Indies. Great horned owls occupy all types of forests, thickets, scrub areas, plains, canyons, cliffsides, river bottoms, and deserts. It occurs throughout Florida.

Reproduction: Horned owls begin nesting early, usually in February and March. Rather than building their own nests, they usually use old nests of hawks, herons, or crows. They sometimes nest on the ground and in tree cavities. Clutch consists of two to three eggs, although anywhere from one to five is common. Both sexes participate in the incubation which takes about 26-30 days. Young begin flying when about nine to ten weeks old.

Food: These big owls will eat just about anything they can catch. A partial list of their menu includes rats, squirrels, rabbits, skunks, ducks, grouse, weasels, even fish and insects.

C. Sandhill

1. Gopher Tortoise (Turtle)

Identification: Gopher tortoises are land turtles with blunt, club-shaped feet very different from the webbed feet of aquatic species. Three species, which differ only in minor ways, are related to the Giant Tortoises of the Galpagos Islands, largest and oldest of land turtles. The relatively high, arched shell and the habit of digging deep burrows are characteristic.

Range and Habitat: The gopher turtle can be found in the sandhills of Florida. It lives in beech scrub, sand pine scrub, and oak hammock.

Reproduction: Up to 15 eggs are laid in the sand. The eggs hatch in about 15 days. Maturity is reached in five to seven years.

Food: The diet of gopher turles consists of plant materials (i.e. grasses, fallen leaves, wild fruits and berries).

2. Pocket Gopher

Identification: Members of this family are small to medium sized; they have external cheek pouches (pockets) which are fur lined and reversible and which open on either side of the mouth. Their large, yellowish incisor (gnawing) teeth are always exposed in front of the mouth opening. The front claws are large and curved for efficient digging tools, the tail, which is always shorter than the head and body, is naked or scantily haired. Eyes and ears are small.

Range and Habitat: The pocket gopher is found in the sandhill community. They are all true burrowers and are seldom seen above ground. Their presence is easily detected by the mounds of earth which they push out as they excavate their subterranean tunnels. The mounds are fan-shaped with an indication

of the position of the opening, which is a round earth plug, the last of the dirt to be pushed to the surface. They never leave their burrows open for long. They prefer soil that is slightly moist and easy to work.

Reproduction: The pocket gopher has a low reproductive rate; each female bears a litter of three to four young a year.

Food: Pocket gophers eat roots and fleshy rhizones (underground growth where roots spread out).

3. Flying Squirrel

Identification: Flying squirrels weigh about three ounces. They do not actually fly, but glide about one hundred seventy-five feet from a high point to a lower point. They can do this because there is a wide membrane between their front and hind feet.

Range and Habitat: Flying squirrels can be found in many places in Florida. They make their nest in hollow trees or on tree branches.

Reproduction: Females usually reproduce when about one year old. They may have two litters a year.

Food: They eat seeds, berries and nuts.

IV. SOIL

Students in each grade level will learn certain specific soil characteristics applicable to all habitats. The soil characteristics to be studied and emphasized at each grade level are outlined below:

A. Three Basic Layers of Soil:

1. Top Soil: This layer is usually rich in organic material. It is slowly built up from the underlying material by the addition of organic material. It is normally darker than the underlying layers. While differentiations are made between layers within this layer, such effort is probably beyond the scope of this activity.

2. Subsoil: This layer is usually lighter in color due to the low organic content. Finer materials and dissolved chemicals are leached out of the top soil and accumulated in the subsoil which usually contains more clay and is more compact. Therefore, water does not pass through these layers easily.

3. Parent Material: This layer is composed largely of rocks and sand. It is not as weathered as the subsoil. There is little or no organic material. Material from this layer adds to the subsoil.

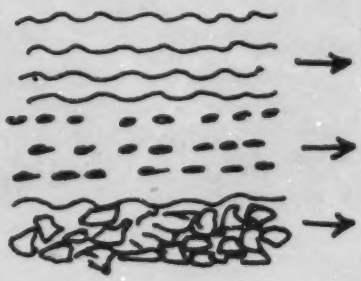
B. The Three Basic Textures of Soil:

The three basic textures are based on the size of the particles:

1. Sandy - gritty, will not ball when wet.

2. Silty - smooth and slick.

3. Clay - sticky when wet, brick-like when dry.



V. ACTIVITIES

This chapter includes classroom and outdoor environmental education activities for K-5 students at Glen Springs Elementary. These activities are suggested to coordinate the teaching-learning process across all grade levels. They include all animals, plants, and habitats in the spiraling Glen Springs Outdoor Education curriculum.

Each sub-section (K-5) includes:

Objectives
Suggested Activities
Materials
Evaluation

For curriculum continuity it is important that student objectives be met at each grade level and that the suggested activities be reserved for that particular grade level. This in no way excludes the possibility of developing other related outdoor education activities suited for the particular level.

KINDERGARTEN
OBJECTIVES AND SUGGESTED ACTIVITIES

I. Objectives

1. The kindergarten student will identify a variety of plants found on the school campus.

2. The student will identify the names and the pictures of the cottontail rabbit and the black bear.

3. The student will know that soil has temperature, texture and smell.

II. Plant Study: Pine Flatwoods, Hardwood Hammock, Sandhill, Grassland

Activities:

A. Students will take a walk around the campus, collect leaves from the different habitats, and make booklets, rubbings, or other art work using the collected materials.

B. Students will discuss and describe the trees observed and verbally identify size, texture, and shape of the trees.

C. Students will collect seeds, acorns, and cones from the campus and make shakers or pictures.

D. While visiting an outdoor classroom the student will listen to and identify the sounds of the environment.

Materials:
Natural materials collected from the school campus
Paper for booklets and art work
Paste
Paper tubes for shakers

Evaluation:
Participation in class discussions and art projects
Discussion
Subjective teacher appraisal

III. Animal Study: Pine Flatwoods, Hardwood Hammock, Sandhill, Grassland

Activities: Cottontail Rabbit and Bear

A. Discuss how animal homes fulfill their needs as does man's home.

B. Discuss the characteristics of the rabbit and bear. How are they different and alike?

C. Make or draw a picture of a rabbit and/or bear.

Materials: Pictures of animals for discussion
Materials for art project

Evaluation: The children will be able to give one characteristic of the bear and the rabbit.

IV. Man-made Habitat

Activities: A. Walk around the school campus. Discuss how man has changed the school environment.

B. Discuss "Litter" and "Glitter". Make litter-bags and pick-up litter from the campus.

C. Perform in a play: Picnic at the Pond (Ecology Plays, Columbia County). See page 32.

Materials: Bags for litter-bags
Materials for play

Evaluation: Participate in class discussion and art projects.

V. Soil Activities

Activities: Soil Temperature and Texture

A. Go to different parts of the campus--
(a) Sandy Area
(b) Shaded Area

B. Dig small handful of soil. Feel the difference, look with and without a magnifying glass.

C. Describe what you feel, see, and smell using words such as--hard, soft, rough, smooth, grainy, damp, musty.

Materials: Magnifying glass
Small spoon

Evaluation: Teacher observation
Student participation

PICNIC AT THE POND
Ecology Play (for Kindergarten)[1]

Cast of Characters:

Narrator - A teacher will assume the narrative and give cues to the children

Ducks - Six children costumed as native ducks

Fish - Seven children dressed as native pond fish, i.e. bream, bass, speckled perch, etc.

Bugs - Eight children dressed as water bugs, beetles, etc.

Frogs - Five children dressed as Leopard Frogs

Heron - One child dressed as white heron

Pond - Twelve to eighteen children placed around circle to delineate pond and to serve as chorus for songs

Trees - Six or seven children to stand along pond edge and to sing with chorus

Lily Pads - Four children to kneel in pond area and sing with group

Freddie McDirt - Child who litters pond

Susie McDirt - Child who litters with Freddie

Narrator:

The water of the pond sparkled brightly on a sunny morning.
(Children dressed as pond swirl and swing streamers.)
Lily pads folated on the water.
(Children as lily pads sway in center area.)
Ducks paddled and quacked.
(Ducks enter, paddle around pond, then group together for song.)

Ducks and Pond Chorus:

Six little ducks that I once knew,
Fat ones, skinny ones, fair ones too.
But the one little duck with the feather on
his back; he led the others with a quack,
quack, quack-quack, quack, quack-quack,
quack, quack.
He led the others with a quack, quack, quack.

[1]McClelland, Jane, and Pipher, Tom, Ecology Plays, Kindergarten Center, Columbia County Kindergarten Center, West Leon Street, Lake City, Fla.

Down to the pond they would go.
Wibble-wobble, wibble-wobble, to and fro.
But the one little duck with the feather on his back,
He led the others with a quack, quack, quack, quack,
quack, quack-quack, quack, quack.

Home from the pond they would come.
Wibble, wobble, wibble, wobble, ho-hum-hum
But the one little duck with the feather on his back, etc.

Narrator:

Many other animals enjoyed the clear, cool water.
Fish swam and hunted for food.
(Fish enter and swim around pond, flipping fins and catching food)

Fish & Pond: singing to tune of "Ten Little Indians"

Swim little fishes through the pond
Swim little fishes through the pond
Swim little fishes through the pond
Catching good things to eat, Yum yum!

(Fish swim to edge of pond in group)

Narrator:

Water bugs darted to and fro on the surface of the water.
(Water bugs run and dart quickly around pond area)

Water bugs and Pond: singing:

Water bugs swimming here, swimming here,
swimming everywhere.
Cross the water to and fro,
How fast the water bugs go, Repeat.
(water bugs dart to edge of pond and kneel)

Narrator:

And the happiest animals of all rested in the warm sunshine on
the speckled log.

Frogs & Pond: (Frogs enter and hop onto their log) singing:

Five little speckled frogs,
Sitting on a speckled log,
Eating some most delicious bugs, Yum, yum!
One jumped into the pool,
Where it was nice and cool,
Then there were four speckled frogs!
Repeat for 4, 3, 2, 1 and end.
Then there were no speckled frogs!
Frogs hop back onto log and sit.

Narrator:

Susie and Freddie McDirt walked along the path,
They had just finished a picnic lunch.
(Freddie and Susie enter and as they walk around the pond they toss paper into it. Some hit the animals in the water.)

Freddie:

That was a fun picnic! It's all right to throw this trash in the pond. There are no living things here.

Susie:

Sure, it won't matter out here in the woods.

Frogs: (standing up and shouting) HEY!

Frog 1: Don't
Frog 2: Throw
Frog 3: Trash
Frog 4: In
Frog 5: Here!

Narrator:

Then all the animals in the pond speak to Freddie and Susie.

All Animals:

(Standing and shaking fingers, fin, wings)
This is our home! Throw trash in a trash can!

Susie & Freddie:

(Children sit down surprised, their mouths open)
WHAT! YOU CAN TALK!

Heron:

(Heron stalks slowly over to children)
Sure we can...especially to teach you a lesson about pollution.

All animals & pond chorus: singing

Clean up, clean up,
Don't throw trash our way.
If our pond is dirty,
We can't live and play!

so-o-o-

Let us all work together, work together, work together,
Let us all work together to keep our water clean,
Then we can all play together, play together, play together.
Then we can all play together in our pond, cool and green.
(tune of "Here We Go Round the Mulberry Bush)

Animals and children exit skipping, singing, chorus second time.

Narrator:

Thank you for watching our program.

All children bow.

FIRST GRADE
OBJECTIVES AND SUGGESTED ACTIVITIES

I. Objectives

1. Students will be able to identify the following animals and plants in their native habitats:

   A. Pine Flatwoods
      Slash Pine
      Bobcat
      Fox Squirrel
      Wild Turkey

   B. Hardwood Hammock
      Live Oak
      Poison Oak

   C. Sandhill
      Turkey Oak

   D. Grassland

   E. Man-made

   F. Soil

2. The students will be able to distinguish texture and temperature of soil of various habitats.

3. Students will learn that soil is an important factor in all land environments.

4. Students will be able to describe the composition of soil (including the moisture content) and will identify different soils in different habitats.

II. Habitats, Plants, Animals

A. Pine Flatwoods

1. Activity: Slash Pine

Go to the outdoor education area and identify a slash pine.
Collect pine cones and have a "pine-cone-throw".
Measure to see who threw a pine cone the greatest distance.
Collect the same pine cones and make owls (Cut beak, eyes, nose, etc.).
Also see "Adopt a Tree" activity, page 50.
Also see Supplementary Tree activity, page 42.

Materials:

Pine cones
Construction paper
Measuring tape

Evaluation:

Students will identify slash pine from pictures and sample branches.
Students will identify slash pine in the outdoor education area.
Pine cones will be converted to owls by the students.

2. Activity: Bobcat

Discuss the characteristics of the bobcat and how he relates to the Hardwood Hammock area.
Make a large mural which includes hardwood tees, plant life, and bobcats.

Materials:

Pictures of bobcats.
Large paper, scissors, paste, construction paper.

Evaluation:

Students will name three characteristics of bobcats.
Murals will include hardwood trees and bobcats.

3. Activity: Fox Squirrel

View film F 1535, Bushy the Squirrel.
Discuss characteristics of fox squirrels: their nests, habits, food, etc.
Go to the outdoor classroom, observe tree-tops and look for leaf nests.
Search for nests in cavities of trees.
Look for foods which squirrels eat: seeds, fungi, fruit, buds, pine seeds, etc. (Sometimes they also eat insects and bird eggs).
Return to the classroom and create pictures of the fox squirrel in his habitat.

Materials:

Film 1535 Bushy the Squirrel
Pictures, paper, crayons

Evaluation:

Students will identify fox squirrels in pictures.
Students will name at least two characteristics of the fox squirrel.

4. Activity: Florida Wild Turkey

Discuss the Florida wild turkey who lives in Pine Flatwoods.
Why are there none in our outdoor education area?

Make pictures of pine flatwoods; be sure to include pine trees.
Be sure there are turkeys roosting in the trees.
Do the turkeys have food in your pictures?
Play the game "Turkeys in the Trees" (Squirrels in Trees).

Materials:

Varied art materials

Evaluation:

Students will include wild turkeys in their creative art work.
Students will state at least two characteristics of wild turkeys.

B. Hardwood Hammock

1. Activity: Live Oak Tree

Discuss the characteristics of the live oak tree.
Collect a bag of leaves and return to the classroom.
Discuss the boat-shape of the leaves.
Fill the sink with water and determine if the leaves will float.
Have students draw the trunk and branches of a live oak tree on large mural paper. Paste real or creative leaves on and around the drawing.
Stress that in this activity we gathered only the number of leaves we needed.
Also see Supplementary Tree Activities, page 42.

Materials:

Bag, leaves, crayons, paste, mural-size paper.

Evaluation:

Students will identify live oak trees in the outdoor education area.
Creative drawings will include tree trunks, branches, and leaves.

2. Activity: Poison Oak, Poison Ivy

Discuss poisonous plants.
Share knowledge and personal experiences with poison plants.
Write an experience chart.
Discuss the characteristics of poison oak.
Talk about how poison oak and poison ivy are "alike" and "different".
Read and/or dramatize this poem:

I went for a walk early one day.
I touched something when I should have stayed away.

"Ha! Ha!" said Poison Ivy. "I got you!"
Now I'm itching and crying and I'm so blue.
It won't happen again, I'll tell you that.
Cause I'm gonna use my thinking cap.
I know you Poison Oak, you won't get me!
No! No! Poison Oak, just wait and see!

Take a walk and find a poison oak.

Materials:

Pictures of poison oak and poison ivy.
Chart paper, magic marker.

Evaluation:

Students will describe, identify, and stay away from poison oak.

C. Sandhill

1. Activity: Turkey Oak

Walk to the outdoor education area and identify the turkey oak.
Discuss characteristics of the turkey oak.
Have each student collect two turkey oak leaves.
Return to the classroom, paste leaves on the bottom of a large paper.
Have each student create his/her own turkey on the same sheet of paper--using the leaves as the feet.
Also see Supplementary Tree Activities, page 42.

Materials:

Turkey oak leaves, paper, crayons, paint, or other art media, paste.

Evaluation:

Students will identify a turkey oak tree.
Students will describe the turkey oak leaf.

2. Activity: Wire Grass

Write the word "wire grass" on the board.
Discuss the meaning of this word.
Discuss this word.
Have students sketch a picture of what they think wire grass looks like.
Go to the outdoor education area and have a "wire grass hunt". (Look for the grass in small groups; when a group agrees that they have identified wire grass they yell "Yippee!" Everyone then observes the wire grass, and discusses the pictures they drew of wire grass.)

Now that you have seen real wire grass return to the classroom and draw what the wire grass really looks like to you.
Compare the previous drawings with the ones completed after seeing wire grass.

Materials:

Paper, pencils

Evaluation:

Students will identify, describe, and illustrate wire grass.

D. Grassland

1. Activity: Identification of Grassland

Go to the outdoor education area; divide into small groups.
Each group tosses a hula hoop and carefully observes the ground cover within that hula hoop circle.
Each group identifies differences in texture, grass, insects, etc.
Groups may classify living and non-living matter and record those observed on a data card.
Return to the classroom where each group gives an oral report.

Materials:

Hula hoops, pencils, data cards.

Evaluation:

Students will participate in all activities.
The teacher will subjectively judge group reports.

E. Man-made Environment

1. Activity: Did it Grow? Did We Make It?

Demonstrate the difference between man-made and natural objects in the classroom.
Challenge the children to find examples of man-made and natural objects.
Label and display man-made and natural objects in the classroom.

Materials:

Paper, pencils, items collected by students.

Evaluation:

Students will correctly classify, sort, label, and display man-made and natural objects.

2. Activity: Effects of Littering

Discuss the meaning of "litter" (Carelessly dumped trash).
Go on a trash-treasure hunt; collect and attach trash-treasures to a poster board.
Present the play "Litteritus" (see page 44).
Plan a field trip to clean up and restore an interrupted environment.

Materials:

Collected trash, poster paper, glue.

Evaluation:

Students will define litter and explain why "littering" is an unaccepted behavior.

F. Soil

1. Activity: Soil is Important

(a) What is soil? Plants grow in it. Wash dirt off your hands.
(b) Where does it come from?
(c) What is it used for?
(d) Are there places where no soil is found?

Divide children into groups.
Go to the outdoor education site.
Select different kinds of soil.
Look at each kind of soil.
Smell, feel, and examine soils with a magnifying glass.
Discuss why soil is important.
Make a chart listing the variety of uses for soil. For example, plants grow in soil, people eat plants that grow in soil, etc.
Learn these words: soil, dirt, magnifying glass, humus, sand.

Materials:

Empty milk cartons, soils, magnifying glasses

Evaluation:

Students will identify soil and give five reasons why soil is important to us.

2. Activities: Differences in Soil

Students will review the composition of soil.
Discuss various types of soil: humus, clay, sand, etc.
Take the class to outdoor education areas; locate varied types of soil.

Place soil samples in labeled glass jars and seal them.
Place the jars in a warm place and check for condensation. (The more humus in the soil, the more water content it has.)
Graph the student findings.
Next check soils for water retention:
Use equal amounts of soil.
Punch pencil holes in bottom of milk cartons.
Fill each with a different type of soil.
Using a plate to catch excess water, pour one cup of water into each carton.
Measure, record and compare the amount of run-off from each type of soil.

Materials:

Glass jars with tops, measuring cups, plates, soil
Masking tape, marking pens, graphing paper, chart paper

Evaluation:

Students will illustrate, graph, or record the water content found in various soils.
Students will state that some soils hold more water than others.

G. Supplementary Activities--Trees

1. Read the following riddle:

What starts from something smaller than a bee?
And soon gets beigger than you and me?
What's bare in winter and bright in fall?
And makes shade in summer for one and all?
What do boys like to climb and girls do too?
And gives many good things to me and you?
A tree, of course!

2. Today, let's take a walk around our school grounds and find a tree to adopt for our very own. (Trees for this grade level are--turkey oak, slash pine or live oak.) Give the tree a name. Example--turkey oak (gobble, gobble), live oak (Larry Live Oak). Make observations throughout the year. Include observations of leaves, seeds, height, animals, buds and insects. Complete the following activities:

(a) In the fall, water the tree during dry periods.
(b) Rake leaves and pile around the base of the tree to protect roots and hold moisture.
(c) On Arbor Day, plant a tree (little friend) nearby. (See suggested poem in item (h) below.)
(d) In winter, put up a bird feeder and keep it filled. Sprinkle seeds around the trunk.
(e) If the tree is young, fertilize it.

(f) Play a game--"Circle the Tree". (Hold hands and sing to the tune of Mulberry Bush, "Here we go round the dogwood tree, dogwood tree, dogwood tree. Here we go round the dogwood tree, whose name is Leafy Lee."

(g) List words that describe the trees.

(h) At the end of the year or at times during the year, the students in the class may write stories about their tree. Include illustrations and make them into a book.

(i) A suggested reading for Arbor Day:

Dear little tree that we plant today,
What will you be when we're old and gray?
The savings bank of a squirrel or a mouse?
For the robin and wren apartment house?
The dressing rooms of the butterflies ball?
The locusts and katydids concert hall?
The schoolboys ladder in pleasant June?
The schoolgirls tent in the July moon?
And my leaves shall whisper right merrily,
A tale of children who planted me.
...Anonymous

(j) Suggested books to read:

A Tree is Nice by Janice May Udry (E Udr Glen Springs Library)
The Forest by Peter Farb (551.452 Far, Glen Springs Library)
A Tree is a Plant by C. R. Bulla (582 Bul, Glen Springs Library)

LITTERITUS
(Ecology Play for First Grade[2])

Cast of Characters:

Narrator - teachers

*Neatoes - singers (49)

Pond - 10 children

Garbage cans - 4 children

Trees - 6 children

Alligator - 1 child

Vet - 1 child

Children - 4 children

Flowers - 6 children

Props & Costumes:

Neatoes - hats

Pond costumes

Garbage can costumes

Gator costume

Vet - doctors coat, black bag

Flower costumes

Tree costumes

Picnic basket and cloth

*Litterbugs Come in Every Size
Golden Press
Norah Smaridge

---

[2] Davis, Douglas, and Hoffman, Ecology Plays, Kindergarten Center, Columbia County Kindergarten Center, West Leon Street, Lake City, Fla.

Setting:

There is a polluted pond, with the six trees and six flowers arranged around the stage.

Narrator:

A long time ago this was a beautiful place. The water in the pond was a clear blue. Flowers, birds, and animals were everywhere. Then big people, boys and girls started coming for walks and picnics. At first the people were tidy and neat, but gradually a few started dropping paper and food. Others became more careless with their trash and litter.
(Boy and girl walk through the area eating candy and dropping school papers.)

Narrator:

Jim and Janie like to go this way on their way home from Kindergarten each day.
(pause)
Hush! I think I hear someone else coming. Yes, it is some children bringing a picnic lunch to the woods. Let's watch.
(Children enter skipping, carrying their picnic basket.)

Child 1:

Hey! This looks like a good place for a picnic. It looks like someone has already been here.

Narrator:

I think the children have noticed the garbage cans tipped over and litter scattered everywhere.

Child 2 says to Child 3:

Come on over and help me spread the table cloth out.

(Child 4 passes out the lunch sacks.)

Child 3:

Golly! I'm starving.

Narrator:

They must have had a good picnic lunch, but look what they did with their trash.

(Children leave their litter scattered all around.)

Child 1:

Hey, you guys! Look at the neat pond.

Children:

Uck!

Narrator:

The children have noticed that the water is a funny color. They thought the water was supposed to be blue. But instead, it is an ucky green.

Child 2:

What's that I see coming through the trees?

Child 3 & 4:

Hey! It's our friend Allie, the Alligator.

Narrator:

Allie joined the children in their play.
Soon he got hungry, so he decided to munch on some grass.
But it was too crunchy, and it tasted funny.
He decided then to get a drink of cool water, But uck!
It tasted terrible.

Allie:

Uck!

Narrator:

Very soon, Allie had to lie down under a tree. He was moaning and groaning, because he had a tummy ache.

Allie:

(Moans and groans)

Neatoes: (Mr. Alligator song)

Mr. Alligator, Alligator, Alligator,
What made you sick?
Mr. Alligator, Alligator, Alligator,
Some foolish trick.

Mr. Alligator, Alligator, Alligator,
What made you sick?
Mr. Alligator, Alligator, Alligator,
Send the doc quick.

(Children exit and return with Doctor Brown)

Narrator:

When the children's dogs and cats are sick, they take them to Dr. Brown. He is their friend, the veterinarian. I hope he can make Allie feel better.

Doctor:

Let's take a look, Allie. (Allie lays down on his back.)

Allie:

(moans and groans) Oh, my tummy, my tummy!

Doctor:

What have you been eating?

Narrator:

Oh-oh children, do you remember the paper and litter Allie was eating? And didn't he drink some water from the pond? (pause) I think I heard the doctor say, LITTERITUS!

Neatoes: (chant)

Litteritus, litteritus.
Poor Allie's got litteritus,
(twice)

Narrator:

When my throat and tonsils hurt, the doctor said I had tonsilitus. Allie ate litter, didn't he? Now he has litteritus.

The doctor told poor Allie to rest, and to stay away from polluted ponds. He told the boys and girls to put their litter in the trash cans.-Not on the ground and in the pond, because that's what made Allie sick. It is also bad for the flowers and the plants that grow nearby.

(Neatoes come down and start cleaning us the area.)

Chanting: "We'll clean it up,
We'll clean it up.
We are the Neatoes,
and we like things neat.

(Children help Neatoes pick up trash and place it in the trash cans.)

Children & Neatoes sing: "A Cleaning We Will Go"
(Tune - A Hunting We Will Go)

A cleaning we will go,
A cleaning we will go,
We'll put a sack
over our back,
A cleaning we will go.

A cleaning we will go,
A cleaning we will go,
And in a flash,
We'll pick up the trash,
A cleaning we will go.

(When the area is cleaned, the children, doctor, and Allie exit. Neatoes return to their position.)

Narrator:

People still come to this beautiful spot to picnic. Now they clean up their trash when they leave. And look how much better the pond looks. And see how pretty the flowers are now.

(Pond changes to blue, and flowers lift their heads and arms.)

SECOND GRADE
OBJECTIVES AND SUGGESTED ACTIVITIES

I. Objectives

1. The students will be able to identify the following plants and animals in their native habitats:

   A. Pine Flatwoods
      Wax Myrtle
      Rattlesnake
      Deer
      Screech Owl

   B. Hardwood Hammock
      Water Oak
      Gray Squirrel

   C. Sandhill
      Longleaf Pine
      Cherokee Bean

   D. Grassland
      Papaw

2. The students will be able to identify layers in the soil.

II. Habitats, Plants, Animals

A. Pine Flatwoods

1. Activity: Comparing Wax Myrtle with Water Oak and Longleaf Pine

Plan a class walk in the outdoor education area.
The purpose of the trip is to locate trees for study (a wax myrtle, water oak, and longleaf pine).
Classify the things we will look for in identifying "our" trees:
   (a) differences in the heights of each tree
   (b) differences in the shapes of leaves
   (c) differences in barks (rough, smooth, sticky)
   (d) differences in sizes of trunks (long, slender--thick, fat)
   (e) kinds of fruits and/or seeds
   (f) inhabitants (insects, birds, squirrels)
Take the planned walk and record the information found.
Compare the wax myrtle characteristics with each of the other trees.
Conduct follow-up discussions in the outdoor classroom, weather permitting.
Repeat the same activity during different seasons of the year, i.e., fall, winter, spring.
Maintain charts or recorded information on the three types of trees.

Materials:

Paper, pencils, charts, markers

Evaluation:

Students will identify differences in trees.
Students will read teacher-recorded information about trees.
In group discussion students will compare trees, verbally analyzing their likenesses and differences.

2. Activity: Animals

Do research (reading stories, viewing films, collecting pictures, etc.) on the following animals:
(a) rattlesnake
(b) deer
(c) screech owl
Individuals will complete creative art projects depicting these animals.
Individuals will write creative notes to particular animals for their contributions to man and the environment.

Materials:

Books, films, worksheets on specific animals, paper, pencils, art media, etc.

Evaluation:

Students will participate in class discussions of the three animals.
Individuals will read and share "thank yous" to animals.
Related art work will be discussed and displayed.

B. Hardwood Hammock

1. Activity: Water Oak Tree--"Adopt a Tree"

Help the class select one water oak tree to study during the year.
Each student (or the entire class) may keep a diary noting changes that occur on the adopted tree.
The tree diary may include sketches, notes, photographs, or other recorded information which contributes to the learning activity.
Discuss all changes in "our" tree as they occur.

Material:

One selected water oak tree
Paper, pencils, drawing materials, camera, film, pictures, art materials, etc.

Evaluation:

Students will observe, record, and discuss changes as they occur in their adopted tree.
Students will reproduce or illustrate visual changes observed at different times during the school year.

2. Activity: Gray Squirrel

After completing research on all three animals students will conduct individual projects on the gray squirrel; each will stress the squirrel's contribution to man and the environment.
Reports will make use of factual information, and may be verbal, pictorial, demonstrative, or written.

Materials:

Vary with individual projects, but will probably include, books, pictures, paper, pencils, art media.

Evaluation:

The teacher subjectively evaluates individual projects in terms of student recall of facts learned, proper written form, creativity, etc.

C. Sandhill

1. Activity: Longleaf Pine

Discuss with class, as preparation, the proper technique to be used in planting a tree.[3]
Select an appropriate area (sandhill) in this habitat and plant a longleaf pine seedling.[4]
Follow-up on survival of the tree planted, and show stages of growth through sketches or (preferably) camera shots, dating each.

Materials:

Longleaf pine seedling
Shovels, pick, hand tools
Leaflets from Forestry Department

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[3]This activity is suggested to be carried out on Arbor Day, if possible. Otherwise, any other suitable time will be appropriate.

[4]Secure leaflets on techniques of planting trees from the Florida Forestry Department or the United States Forestry Service.

Evaluation:

Students participate in discussion, planting, and follow-up activities.
Students can describe the sandhill habitat as related to survival of longleaf pines.

2. Activity: Cherokee Bean

Students will study the characteristics of the cherokee bean in the classroom. For example:

(a) Cherokee bean plants have red flowers which grow in long bunches.
(b) They bloom in late winter or early spring.
(c) Stems are prickly.
(d) Plants grow tall.
(e) Leaves are shaped like triangles.

See pictures of the cherokee bean.
Discuss the meaning of poisonous things, and emphasize that the cherokee bean is a poisonous plant which we should never touch. Because they are poisonous the seed pods and the beans should never be cracked.
Locate and observe the cherokee bean plant on our campus. DO NOT TOUCH.
Draw pictures illustrating the plant, leaves, flower and seed pods of the cherokee bean.
Create a story illustrating the bad effects of poisonous plants.

Materials:

Pictures of the cherokee bean plants.
Drawing paper
Crayons
Other art media

Evaluation:

Students will identify cherokee bean plants in photographs or illustrations.
Students will name several characteristics of the cherokee bean including its poisonous nature.

D. Grassland

1. Activity: Papaw

On a walk in the school outdoor education area students will identify the papaw plant. Attention will be given to:

(a) height (grows "very tall"--up to forty feet)
(b) fruit (greenish brown rind, yellow inside)
(c) the fruit could be eaten but it does not taste good
(d) leaves have umbrella shapes
(e) bark is sometimes used for making fish nets
(f) it is similar to some other plants (i.e., magnolia, banana).

Teach the song "Way Down Yonder in the Papaw Patch".
Draw pictures of the papaw plant.

Materials:

Selected art media
Music to "Way Down Yonder in the Papaw Patch".

Evaluation:

Students will recognize the papaw plant.
Vocabulary will include height, fruit, leaves, and bark as students discuss their reactions to the papaw plant.
Pictures will illustrate appearance of the papaw plant.

2. Activity: Animal Life

Explore the school environmental site to look for signs of animals living there.
Discuss the findings which are observed.
Help students find signs of animals feeding in the area.
Help students find signs of animal homes being established.
Teach students to leave homes and feeding areas undisturbed--as they were.

Materials:

None

Evaluation:

Students will identify signs of animal life on the school site.
They will locate homes and feeding areas for small animals.
Animal homes and feeding areas will be left undisturbed by the students.

E. Related Supplementary Activities

1. Activity: Food chain, Role Playing, Interrelationship Between Plants and Animals

Discuss the concept of the food chain.
Role-play "Nature Name" game:
Stand in a circle with an arms length between the students. Each child is assigned a thing in nature. Hang a sign with the student's "nature name" around his neck. (Use names like bird, squirrel, grass, cow, pine tree, oak tree, cat, insect, etc.) The teacher begins to make up a story; one that causes a reaction, and the students pick up on the story, continue it, and act it out; i.e., The cat wakes up from his nap, hungry. He sees a bird and chases it up the oak tree. The bird spys an insect and picks it....

Materials:

Nature name signs

Evaluation:

Students will actively participate in role-playing "Nature Name."
Students will describe the interrelationship between plants and animals.

2. Activity: Awareness, Sensitivity, Appreciation of the Environment

Students will discuss their rights to live where they wish.
Living where we choose will be related to meeting given needs for survival, i.e., water, food, shelter.
Relate the knowledge of ourselves to the world of animals.
Visit the outdoor education area and determine where animals exist.
Identify things which animals need for existence, i.e., water, food, shelter.
Lead the students to infer why certain animals live in specific areas or habitats.
Create pictures of animals living in their habitats.
Create pictures of people living in our habitats.
Compare "likenesses" and "differences."

Materials:

Creative art materials for drawing, sketching, painting, etc.

Evaluation:

Students will depict animals which live within the outdoor education site.
Families of students will be illustrated in their own habitats.

3. Activity: Leaves of Trees

Take a walk on the nature trail.
Collect leaves from the longleaf pine, water oak, and wax myrtle.
Discuss characteristics of each leaf--color, size, shape, and texture.
Have students illustrate each leaf and write one or two sentences to describe each picture.

Materials:

Sketching materials
Writing tools and paper

Evaluation:

Students will participate in class activities.
Illustrations and sentences will accurately describe the three types of leaves.

F. Soil

1. Activity: Erosion

Take the class for a short walk on the school grounds on a rainy day.

Visit places which are covered with grass and other plants.
Visit places where the soil is bare.
Compare level areas with steep or sloping areas. Note the appearance of the water in each place. (Students should observe water running.)
Return to the classroom and show the filmstrip The Muddy Raindrops.
Discuss why one part of the stream was clear, and the other part was muddy.

Variation: Follow the same procedure as above, using a hose.
Run water on grassy area and bare area.
Note what happens.
Compare level and sloping areas.
Note what happens.

Materials:

Paper, pencil
Filmstrip projector
Filmstrip: The Muddy Raindrops

Evaluation:

Students will actively participate in observations and discussion activities.
Students will answer the following questions correctly:
(a) What happened to the soil on the steep land with plants? (It did not wash away.)
(b) What happened to soil on the steep or sloped land where plants were worn away? (The soil washed down the slope; this is called erosion.)

2. Activity: Soil Formation

Place soil samples from each of the three habitats in quart-size jars.
Mix with water (one third soil two thirds water)
Shake the soil and water in the jars.
Set the soil-water mixture aside, then in a couple of days note the settling which occurs.
Observe the different layers of soil.

Materials:

Three quart-size jars
Soil, water

Evaluation:

Students will participate in collection and observation activities.
Students will see and identify layers of soil--top soil and subsoil.

3. Activity: Soil Layering

Select an area and dig a pit with sloping sides (This can be covered later).
Observe and note layers of soil. (Students will be able to see only two layers: top soil and subsoil. Parent soil will be too deep to dig for or observe.)
Encourage the students to take handsful of soil to try to see its layers.
Examine the soil at each layer for color, smell and texture.

Materials:

Shovel
Paper, pencil, drawing materials

Evaluation:

Students will identify top soil and subsoil layers and call them by correct names.
Students will draw pictures showing layers and textures of soil.

THIRD GRADE
OBJECTIVES AND SUGGESTED ACTIVITIES

I. Objectives:

1. The students will identify the following plants and animals in their native habitats:

A. Pine Flatwoods
Gallberry
Blueberry
Stinging Nettle
Indigo Snake
Red-shouldered Hawk

B. Hardwood Hammock
Laurel Oak
Marsh Rabbit

C. Sandhill
Wild Plum
Gopher Tortoise

2. The students will describe the organic and inorganic matter in the soil.

II. Habitats, Plants, Animals

Introduction

1. Activity: Introductory Activity

Discuss five habitats found on playground.
On a class chart list:
(a) their characteristics
(b) animals studied so far that are found in each of the habitats
(c) plants and trees studied so far that are found in each habitat.
Take a walk on the playground with the class. Have the class observe and note animals and plants seen in each habitat.

Materials:

Chart paper, markers

Evaluation:

Students will identify the five habitats in the school outdoor education area.
Students will name plants and animals found in each habitat.

A. Pine Flatwoods

1. Activity: Gallberry

Discuss the characteristics of the gallberry.
Be sure to explain that the gallberry and blueberry are classified as shrubs, not trees. Have the class define the difference between a shrub or tree.
Locate a gallberry shrub and a blueberry shrub on the playground.
While viewing each shrub have different class members verbally describe the characteristics of each shrub.

Materials:

None

Evaluation:

Students will correctly identify the blueberry and gallberry shrubs.
Students will accurately describe the characteristics of the blueberry and gallberry.

2. Activity: Blueberry

Read about blueberries.
List the different uses of blueberries.
Have the class make two blueberry pies to eat.

Materials:

Ingredients for blueberry pie
Recipe for blueberry pie

Evaluation:

Students will identify the blueberry plant and fruit.
Students will list uses of blueberries.

3. Activity: Stinging Nettle

Discuss the characteristics of the stinging nettle. Be sure to include the fact that stinging nettle is classified as a weed. Students should be able to define and compare the terms tree, shrub, and weed.
Help the class find stinging nettle on the playground. Remind students that stinging nettle can be found in all the habitats on the playground.
Give students a prescribed amount of time (5-10 minutes) to determine if they can find other examples of stinging nettles on the playground.

Materials:

None

Evaluation:

Students will identify stinging nettles.

4. Activity: Indigo Snake

Read about the indigo snake. Discuss his physical appearance and eating habits in detail.
Review information about the diamondback rattlesnake presented in the second grade.
Compare the indigo snake with the diamondback rattlesnake.
Compare the characteristics of nonpoisonous and poisonous snakes:
(a) shape of head
(b) shape of eye and eyelid
(c) tooth structure
Divide the class into six groups. Three groups should make a papier mache indigo snake chasing a small mammal; three groups should make a papier mache diamondback rattlesnake. All groups should paint their snakes appropriately.

Materials:

Papier mache ingredients
Tempera paint

Evaluation:

Students will correctly name the characteristics of poisonous and nonpoisonous smakes.
Papier mache models will resemble indigo snakes and diamondback rattlesnakes.

5. Activity: Red-shouldered Hawk

Read to the class about the red-shouldered hawk. Show a picture of the red-shouldered hawk to the class. Discuss in detail the distinguishing characteristics of this bird.
Have students draw, color, and cut out a picture of the right side of the red-shouldered hawk, then the left side of the bird.
Staple sides partly together. Stuff with newspaper. Staple sides completely together to form a three dimensional bird.
Attach a string to top of each bird through punched hole.

Materials:

Stapler
Newspaper, construction paper, string
Hole puncher
Crayons, paint, et al.

Evaluation:

By observing the finished art work, the teacher will determine if the students showed the distinguishing physical characteristics of the red-shouldered hawk.

B. Hardwood Hammock

1. Activity: Comparing Live Oak, Water Oak and Laural Oak Leaves

Take the class outside. Observe a laurel oak, a live oak, and a water oak tree in the Hardwood Hammock habitat.
Discuss observable differences between the leaves (color, size, shape, and texture).
Each student should draw an example of each leaf. Each drawing should be labeled and include a short written description of each leaf.

Materials:

Crayons, pencils, drawing paper

Evaluation:

Students' leaf drawings will accurately depict the characteristics of the three different oak leaves.

2. Activity: Leaf Game

Review characteristics of the leaves of slash pine, live oak, turkey oak, wax myrtle, and laurel oak. Show the class an example of each.
Collect enough leaves for each student to have one, but be sure to get two leaves from each tree.
Place the leaves in a box or bag.
Let each student pick a leaf. Students can then take turns describing their leaves. Encourage details. What habitat is it from?
Then let the students find the others with the same kind of leaves.

Materials:

Leaves
Bag or box

Evaluation:

Students will locate the other students with the same kind of leaf.
Students will accurately identify five types of leaves.

3. Activity: Marsh Rabbits and Cottontail Rabbits

Have students read ditto on Florida rabbits (description and labeling of cottontail rabbit and marsh rabbit).
Compare the marsh rabbit to the cottontail rabbit.
Students should draw either a marsh rabbit or a cottontail rabbit.
On the back of their drawings, students should write descriptive paragraphs about their rabbit.

Materials:

Ditto
Drawing paper, crayons

Evaluation:

Students will accurately describe the marsh rabbit and the cottontail rabbit.
Teacher will subjectively evaluate drawings to determine if distinguishing characteristics are included.

C. Sandhill

1. Activity: The Wild Plum

Read about the wild plum. Discuss in detail:
(a) the appearance of the plum leaves
(b) the plum as a fruit (its value and appearance)
(c) the fragrant white flowers
Divide the class into groups of four or five students. Each group should make a collage demonstrating the different characteristics of the plum tree. For example, one child in a group might draw the plum fruit; another, plum leaves; another, plum trees blooming in spring; and another, different kinds of plum products.

Materials:

Picture of wild plum
Crayons, construction paper, paste, drawing paper

Evaluation:

Students' collages will illustrate that they can identify the wild plum and are familiar with its uses.

2. Activity: Gopher Tortoise and Animal Interviews

Discuss the gopher tortoise, its physical characteristics and living habits.
Review all animals studied so far.
Divide the class into four groups, a group for each animal.

In each group, one person will be the animal studied and the other students will be the reporters.
The reporters should write a list of questions they would like to ask the animal. The student must respond as if he or she were actually the animal. Let each group rehearse their interview.
Then, all four groups should take turns presenting their interviews to the class.

Materials:

Paper and pencils

Evaluation:

The teacher will observe and evaluate the animal interviews. Reporters will ask good questions. Animals will answer from the animal's viewpoint.

D. Supplementary Activities

1. Activity: Web of Life Game[5] (reinforces the idea of interdependence)

Give each child a card with a name of something in nature (grass, rain, air, etc.).
Leader holds the card that says "sun". He also holds a ball of twine. He throws the ball holding on to the end of the twine.
When a child catches the ball he turns his card up and Mr. Sun tells how the person he threw the ball to depends on him.
That child then tosses the twine to another child while holding on to part of the twine. He then tells how the new person depends on him and so the game progresses until a web of interdependence has been woven.
If the teacher should cut the string, thus making a break in the web of life, have the children discuss what happens.

Materials:

Ball of twine
Labeled cards

Evaluation:

Students will understand how all the parts of nature depend on each other, and will illustrate this by their participation in the game.

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[5]This game is reproduced from Living in Florida: Life Environment, Polk County Public Schools, Bartow, Florida, 1975, p. 32.

2. Activity: Evaluation

Complete the class chart which was previously begun. (Add newly studied plants and animals under the appropriate habitat headings.)
Divide the class into four groups. Assign one habitat to each group.
Each group should go outside and closely observe their habitat.
Each group will then be responsible for making a three dimensional model of their habitat, including plants, trees and animals.

Materials:

Models may be made of clay, construction paper, oak tag, cardboard, or a combination of art media, i.e., crayons tempera, paint, cut-paste.

Evaluation:

Student models will include the plants and animals found in their habitat.

E. Soil

1. Activity: Soil, Organic Material

To become aware that soil contains both organic and inorganic materials the students will take soil samples from each of the four habitats on the school site. They will answer the following questions:
(a) What can we learn by feeling it?
(b) Is it cool or warm? Moist or dry?
(c) If you squeeze it in your hand, does it stick together? What makes it do this?
(d) Does soil have water in it?
Using a hand lens, have the students separate the four soil samples into things that look different and things that look alike.
(a) Does any of it look like wood?
(b) Part of a tree or plant?
(c) Small rocks or sand?
(d) Any worms or insects?

Materials:

Spoon or spade
Hand lens

Evaluation:

Students will participate in all activities and properly identify both organic and inorganic materials found in soil.

FOURTH GRADE
OBJECTIVES AND SUGGESTED ACTIVITIES

I. Objectives

1. The students will identify the following plants and animals in their native habitats:

   A. Pine Flatwoods
      Sumac
      Black Snake
      Raccoon

   B. Hardwood Hammock
      Magnolia
      Pileated Woodpecker

   C. Sandhill
      Bluejack Oak
      Gopher Apple
      Flying Squirrel

2. Students will discuss, understand, and illustrate the harmful effects of soil compaction.

3. Students will measure, understand, and compare temperatures in man-made sidewalks, roads, buildings, etc., with temperatures in natural habitats.

II. Habitats, Plants, Animals

A. Pine Flatwoods

1. Activity: Sumac

Review plants studied in earlier grades.
Help students become familiar with plants to be studied in grade four.
Play plant identification games, for example:
Make cards with different leaves covered with plastic wrap, or use realistic illustrations of leaves. Show the cards or illustrations; students match the names of the plants with the proper leaves.
Help students identify single and compound leaves, include the features of the sumac.

Materials:

Leaves covered with plastic wrap
Photographs of leaves
Word cards

Evaluation:

Students will properly identify sumac and assorted other plants.

2. Activity: Black Snake

Black snakes may live in Hardwood Hammock, Pine Flatwoods or Sandhill.
The students will study different kinds of snakes.
View film F-122, Reptiles.
Collect pictures and compare poisonous and non-poisonous snakes. (Poisonous snakes have arrowshaped heads bigger than their bodies, slit-shaped eyes, and hollow fangs. If the fangs are damaged a reserve pair appears. Non-poisonous snakes have rounded heads and round-shaped eyes. They have no fangs, and their teeth point to the rear.)
Make papier mache replicas comparing poisonous and non-poisonous snakes.

Materials:

Reference books, Reptile Manuals, etc.
Film F-122 Reptiles
Pictures and photographs of poisonous and non-poisonous snakes
Newspaper, paste, paint, etc., for making papier mache

Evaluation:

Students will correctly identify pictures of poisonous snakes.
Students will correctly describe the black snake and will identify it as non-poisonous.
Students will complete accurate written comparisons of poisonous and non-poisonous snakes.
A creative papier mache snake exhibit will depict correct characteristics of poisonous and non-poisonous snakes.

3. Activity: Raccoon

Collect pictures of raccoons.
Study raccoon tracks in Rue's The World of the Raccoon, pages 32-33; make clay replicas of tracks.
Take a field trip and try to locate actual tracks, a burrow or home.
If found, make plaster impressions of raccoon tracks.
Illustrate raccoons in their habitats.

Materials:

Photographs and illustrations of raccoons
Reference books
Clay
Plaster of Paris

Evaluation:

The student will accurately describe the habits of the raccoon.
Clay replicas of raccoon tracks will depict their major characteristics.
Illustrations of raccoons in their natural habitat will show correct shape, size, color, habitat and food.

B. Hardwood Hammock

1. Activity: Southern Magnolia

Introduce the magnolia plant with the use of a plant key.
Take a nature walk.
Collect sample magnolia leaves for a notebook collection of various plants.
Arrange for a field trip to an area with a larger Hardwood Hammock.
Make impressions of magnolia leaves in plaster.
Discuss and illustrate the appearance of the magnolia leaves and the bark of the tree.

Materials:

Plant key
Magnolia leaves
Plant notebook
Plaster
Art media

Evaluation:

The student will correctly identify magnolia leaves.

2. Activity: Pileated Woodpecker

The Glen Springs area of environmental study is small and so populated with humans that many Hardwood Hammock animals are seldom seen in the area. Some animals may be nocturnal, others are very timid. However, pileated woodpeckers do live in the area and are occasionally seen on the school grounds. The students should

Collect pictures of the pileated woodpecker.
Learn its habits through library research, i.e., Birds of North America, Encyclopedias, Wildlife magazines, etc.
Arrange a field trip to Morningside Nature Study Area. Try to locate, observe, and/or illustrate the pileated woodpecker in his natural habitat.

Materials:

Photographs
Library reference books
Magazines

Evaluation:

Students will identify pileated woodpeckers in illustrations and books.
Students will describe and illustrate pileated woodpeckers in their natural habitat correctly indicating size, color, body formation, and preferred foods.

C. Sandhill

1. Activity: Bluejack Oak

Identify the bluejack oak with the use of a plant key.
Locate a bluejack oak.
Play the leaf game.
Collect leaves sufficient for each student to have one, make sure to acquire two leaves from each type of tree or bush: magnolia, bluejack oak, gopher apple, sumac.
Place the leaves in a box or bag. Students will take turns picking a leaf and describing the leaf in detail.
When all of the students have had a turn picking and describing leaves have them form partnerships with the student with the same kind of leaf.
Pairs should then observe, describe, and compare the leaves with each other.

Materials:

Magnolia, bluejack oak, gopher apple and sumac leaves

Evaluation:

Verbal descriptions of leaves will be accurate.
Paired-comparison teams will accurate describe, discuss, and compare leaves of the same species.

2. Activity: Gopher Apple

Introduce the gopher apple with the use of a plant key.
Take a nature walk and identify the gopher apple.
Help the students create a Leaf Dictionary which will illustrate all the plants which have been studied. Include descriptions of the leaves and bark.

Materials:

Plant key
Art paper
Sketching media
Pencils or ink

Evaluation:

Students will correctly identify the gopher apple.
Students will complete a leaf dictionary which will include the gopher apple.

3. Activity: Flying Squirrel

Squirrels live in both the Hardwood Hammock and the Pine Flatwoods.
Study the flying squirrel through books, research, group discussion, etc.
Learn it's size, habits, and description.
Collect flying squirrel pictures.
Take a nature walk and identify possible squirrel homes in tree tops.
Write a creative story about A Night in the Life of a Flying Squirrel.

Materials:

Books, photographs and pictures of flying squirrels
Paper, pencil and art media for writing and illustrating a story

Evaluation:

Students will correctly identify a flying squirrel and accurately describe its size, color, habits, characteristics, etc.

D. Supplementary Activities

1. Activity: Plants and Animals

Create and play Animal Bingo. After studying the various plants and animals read a description of the plant or animal name on their bingo card. Show pictures of the animals, students play bingo by covering names of plants or animals on cards.

2. Activity: Animal Dictionary

Create an Animal Dictionary. Illustrate all the animals that have been studied and write a description of the various animals and their habits.

E. Soil

1. Activity: Harmful Effects of Soil Compaction
(Hardwood Hammock, Pine Flatwoods and Sandhill)

Follow these directions:
(a) Remove both ends from two identical tin cans. Select a source of water, a measuring cup, a hammer, a ruler, and a watch.
(b) Select at least two areas for study. One should be grass covered, one should be on the edge of a path or gully.
(c) Drive the cans down into the soil a depth of two inches.

(d) Fill each can with water.
(e) Measure the drop in water level at five-minute intervals for twenty minutes.
(f) Shift to thirty minute intervals and measure the drop in water level until empty.

Materials:

As listed in (a) above.

Evaluation:

Through discussion techniques students will find the answers to these questions:
(a) Which area absorbed the water fastest and why?
(b) If water is not absorbed into the soil where does it go?
(c) What does fast-moving water flowing over soil carry with it?

F. Man-made Environment

1. Activity: Temperature Differences Between Man-made and Natural Habitats

Measure and record the temperature of Hardwood Hammock, Pine Flatwoods and Sandhill.
Measure and record the temperature of an area covered with cement (sidewalk, street, etc.).
Measure and record the temperature of an area at the side of the school building.
Make a chart illustrating the temperature differences.

Materials:

Thermometer
Writing paper, pencils
Graph paper or chart paper

Evaluation:

Compare and discuss the recorded temperature differences.
In comparing and discussing the varying temperatures the students will conclude that temperatures are changed by man-made environment.
The charts or graphs prepared by the students will depict accurate temperatures recorded and visually indicate the temperature differences between man-made and natural habitats.

FIFTH GRADE
OBJECTIVES AND SUGGESTED OBJECTIVES

I. Objectives:

1. The students will identify the following plants and animals in their native habitats:

A. Pine Flatwoods
Opossum
Red-cockaded Woodpecker

B. Hardwood Hammock
Hickory
Red Oak
Beauty Berry
Sparkle Berry
Smilax Vine
Great Horned Owl

C. Sandhill
Pocket Gopher

D. Grassland
Sensitive Briar

E. Man-made

2. The students will learn soil differences and treatments.

3. Students will use keys to identify plants.

4. Students will construct a food chain.

5. Using animals observed in several habitats students will construct a food webb.

II. Habitats, Plants, Animals:

A. Pine Flatwoods

1. Activity: Opossum

Draw a realistic picture on the chalkboard of a pine flatwoods habitat.
List pine flatwoods characteristics: slash or longleaf pine trees (open canopy), wire grass, saw palmetto, gallberry shrub, wax myrtle shrub, small oaks, soil not well drained.
Have volunteers make posters from these descriptions.
Tell the students that the opossum is one animal that lives here.
Discuss the characteristics of the opossum. What do his tracks and droppings look like? (See Peterson's Field Guide series Animal Tracks.) What does the opossum eat? (He eats fruit; look for seeds in droppings.)

Materials:

Chalkboard
Picture of opossum

Evaluation:

Teacher observation:
Students will exhibit interest in the opossum,
Students will participate in discussion and related activities.

2. Activity: Red-cockaded Woodpecker

The red-cockaded woodpecker is an endangered species. Introduce this activity by asking: "What is an endangered species?"
Elicit responses from students and list the names of endangered animals on the chalkboard.
Through discussion, focus this study on one endangered species--the red-cockaded woodpecker.
List the red-cockaded woodpecker's description and behavorial characteristics on the chalkboard. See David Lahart's "Florida's Endangered Dozen" which is reprinted in Appendix A, page 80 of this curriculum guide.
Show pictures of the red-cockaded woodpecker and identify his home as the mature pine forest of southeastern United States.
Ask "Why do you think this bird is endangered?" (This is due to general urbanization and the development of the lumber industry. More information is found in George E. Smith's "Saving the Red-cockaded Woodpecker", reprinted in Appendix B, page 89 of this curriculum guide.
Optional activities are suggested below:
(a) Take a field trip to Morningside Park to observe the red-cockaded woodpecker.
(b) Identify and list twelve endangered species using "Florida's Endangered Dozen."
(c) Have the students work in pairs and do research on the pine barrens tree frog, wood ibis, brown pelican, Florida panther, Okaloosa darter, indigo snake, round-tailed muskrat, American crocodile, sandhill crane, bald eagle, Everglade kite, and red-cockaded woodpecker.
(d) Using silhouettes of animals, make bulletin board exhibits of endangered species.

Materials:

Reprints in Appendices A and B of this chapter.

Evaluation:

Students will participate in discussion and related activities.
Students will state the correct meaning of "endangered species".
Students will give specific examples of endangered species and state the reasons why the red-cockaded woodpecker is endangered.

B. Hardwood Hammock

1. Activity: Using Keys to Identify Plants

Suggested steps for learning to use keys to identify plants may include:

(a) Have leaves of fruit (or pictures of leaves or fruit) of hickory, red oak, beauty berry, sparkle berry, smilax.
(b) Begin identification procedures with a tree (These are usually easier to key). Use clue charts to help record information.
(c) When the name of the plant is determined, then begin to relate the name to other characteristics of the tree.
(d) Discuss why the (red oak tree) was given that name. Do we see any other trees nearby? Where do they grow?, etc.
(e) Continue similar discussion with all five plants.
(f) Divide into five groups and assign each group one plant to study in depth.
(g) Have all groups report their findings.
(h) Make leaf mounts, using leaves, adhesive-backed acetate, and cardboard.

Materials:

Plant keys
Hand lens
Leaves
Adhesive-backed acetate
Cardboard

Evaluation:

Students will complete the chart below naming the characteristics of these five plants. (See Section II. Plants, pp. 8-17.)

Plants	Where It Grows	Distinguishing Characteristics
Hickory		
Red Oak		
Beauty Berry		
Sparkle Berry		
Smilax		

2. Activity: Constructing a Food Chain

Describe the great horned owl (size, color, head and body characteristics).
Display a large picture of the owl and discuss his range and habitat.
Make a list of the animals the great horned owl will eat. (A partial list will include rats, squirrels, rabbits, skunks, ducks, weasels, fish, insects, snakes.)
With the entire class assisting, select one animal from the hardwood hammock and construct a food chain on the board.
Explore what would happen if one major group of organisms were eliminated.

Materials:

Large picture of a great horned owl
Chart paper
Paper, pencil

Evaluation:

Each student will independently select an animal from the hardwood hammock and construct a food chain.

3. Activity: Constructing a Food Web

Briefly review the general characteristics of five habitats: hardwood hammock, pine flatwoods, grassland, sandhill, man-made.
Working in small groups students will list all animals or evidence of animals observed in the five habitats.
Students will then work independently to identify other animals who might live in the five habitats.
Each group will then classify their lists of animals according to what they eat:
Herbivores (plants)
Carnivores (animals)
Omnivores (both)

Using all the animals from one habitat the students in each group will then construct a food web, first using the chalkboard or paper for rough draft copies.
Each group will then complete one poster which demonstrates the food web.
Groups will then use their posters to share what they have learned.

Materials:

Paper, pencils, chalk
Poster Board
Markers or chart-writing tools.

Evaluation:

Posters will correctly demonstrate the basic concept of a food web.

C. Soil

1. Activity: Living Creatures Affect the Soil

Emphasize that the organic component of soil is the home of many living creatures.
Have the students dig several 6 x 6 x 6 inch holes in the outdoor education area. (Instruct them to be careful not to over-use a particular area, and to refill the holes when finished with the dirt and material.)
In groups of two or three, have the students carefully pick through the soil looking for living things.
Sort living things into containers. (Use cardboard as a work-table.)
Discuss the effects of living creatures on the soil.
Discuss what creatures do to the soil when they are dead.

Materials:

Shovel
Small containers
Cardboard
Hand lens

Evaluation:

Students will participate in all activities and will respond correctly to questions pertaining to ways living creatures affect soil.

2. Activity: Observing and Preventing Soil Erosion

Locate examples of soil erosion on the campus.
Observe, record and/or project changes that occur over time.
Determine what caused the erosion (water? wind?)

Suggest what could be done to stop wearing away of the topsoil.
Discuss what will happen if the erosion continues.
Plan actions for preventing the types of erosion observed.

Materials:

None

Evaluation:

Students will record observations of soil erosion, state probable causes of the erosion, and project corrective measures to prevent further erosion.

3. Activity: Soil Analysis and Treatment

Help the students understand the basic principles of soil pH: We use pH as a measure of the acidity or alkalinity of the soil. It is measured on a scale of 1 to 14. Most plants will grow only within a specific pH range. As the soil becomes more acidic or more alkaline, the composition of the plant community on that soil may change.
Take soil samples from a garden plot, a grassy area, and a pasture.
Take or send these to the Alachua County Agricultural Extension Service with the following requests for information:

(a) Garden plot soil:
What is the best pH for growing vegetables?
Does lime need to be added to this soil?
What fertilizers are recommended for garden soil?

(b) Grassy area soil:
What is the best pH for a lawn?
Would Centipede or St. Augustine grass be best for this soil?
What fertilizers are recommended for this soil?

(c) Pasture area soil:
What is the desired pH for a pasture?
What grass is recommended for this soil, Bahaia or Bermuda?

Materials:

Three jars
Digging tools
Jar labels
Marker

Evaluation:

Students will state the meaning of soil pH.
Students will identify the Agricultural Extension Service.

4. Activity: Soil Difference

Divide the class into three groups:
(a) Garden plot soil
(b) Grassy area soil
(c) Pasture area soil
Using the information received from the Agricultural Extension Service each group will plan a procedure for sharing the information with the rest of the class.
Group presentations will be given.
The total group will then develop a class information chart for future reference. (Use the chalkboard to develop the chart, then transfer the final form to posterboard.)

Materials:

Information received from Agricultural Extension Service
Chalk
Posterboard
Markers

Evaluation:

Students will identify different soil treatments for different uses.

D. Optional Culminating Activities

1. Activity: Plants and Animals

Discuss a variety of plants and animals studied.
Locate pictures of each and paste them on a large cardboard.
Put the names of all the animals on separate cards.
Attach each card to the board, randomly arranged.
Put brass fasteners under each picture and beside each name card.
Wire each picture card to its name card with wires on the back of the board.
Place another piece of board on the back to cover the wires.
Using a battery and a bulb with two connecting wires, have the students match pictures with names. (Correct names will cause the bulb to light.)

Materials:

Two large pieces of cardboard
Pictures of animals and plants
Cards for listing the names of each plant and animal
Insulated wire
Brass fasteners
Battery, bulb, and two connecting wires

Evaluation:

Students will correctly match the names and pictures of plants and animals.

2. Activity: Field Trip to Florida State Museum

Schedule this activity two weeks in advance.
Plan and implement a field trip to Florida State Museum.
Observe a variety of specimens in the Object Gallery.
Visit the Cave exhibit and note the environmental factors and their influence on the habitat, i.e. energy flow through an environment.
Observe a mesic hammock exhibit and relate this to the school environmental studies.

Materials:

Bus transportation
Florida State Museum Teacher Guide

Evaluation:

Students will informally relate their environmental education knowledge to the exhibits observed at the museum.

APPENDICES

APPENDIX A

FLORIDA'S ENDANGERED DOZEN[6]

By David Lahart

Florida is changing. Look around. You can see many changes taking place, but there are other changes you can't see. Many of these smaller, more subtle changes influence Florida's environment more than the obvious ones. Scientists monitor and predict the results of these environmental changes, and wildlife helps them.

Wildlife is more sensitive to environmental changes than man. Wildlife can tell us when a stream is too polluted, a marsh is too dry, a forest is being overharvested, or if a watershed is loaded with pesticides. By studying wildlife, man can study the environment.

Florida is fortunate to have abundant natural resources and a climate that lets us enjoy them. But our wildlife is trying to tell us something. Each year the plight of another species comes to our attention. Here are the stories of a dozen Florida animals that are hovering on the brink of extinction.

Pine Barrens Tree Frog

This frog is so rare in Florida that it wasn't discovered until 1970. Its range seems to be restricted to a very small part of Okaloosa County. Almost nothing is known about its life history here, except that it is very secretive. The Florida Game and Fresh Water Fish Commission placed this 2-inch amphibian on the endangered species list until more can be learned about the size of the population, its habitat requirements, and its Florida range.

The New Jersey population of this tree frog is found in the swamps, bogs, and brown, acid waters of the pine barrens. Like all hylids, the pine barrens tree frog has discs on the ends of its toes. The light-bordered, plum-colored band along each side of the body, with the yellow spots below, give this beautiful little frog its unique character.

Until the recent discovery, the closest this frog had ever been found to Florida was in North Carolina. An expedition from Cornell University found it there in 1922. There is a lot of speculation as to how and when this species joined Florida's nine other members of the family Hylidae. We may never find the answers, but this interesting creature nonetheless adds more diversity to the fauna of the state.

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[6]Lahart, David, "Florida's Endangered Dozen", Florida Wildlife, February 1973, pp. 80-85. (For additional copies of this article and more information on Wildlife Week contact C. Richard Tillis, Florida Department of Education, 377 Knott Building, Tallahassee, Florida 32304.)

Wood Ibis

The wood ibis may better be called a stork. It is the only member of that family living in North America. The fate of the wood stork is tied to its breeding grounds, which are located in Florida. Although the huge wilderness tracts are gone forever, some sanctuaries remain, and in these the remnant breeding population of storks annually attempts to produce more of its kind than were lost during the previous year.

The great birds, commonly called "flintheads" or "ironheads," converge on Florida swamps during the winter breeding season. High in the trees they build their nests of sticks, where three or four brown-spotted, white eggs are laid. When nesting is over, the wood storks scatter throughout the Southern states.

Storks are highly social, and where flocks gather to feed they make a striking picture. Shallow ponds and coastal lagoons and marshes are their favorite haunts. When feeding they move slowly over the soft bottoms, their feet stirring up fish, crawfish, and small water snakes, which are seized between their heavy, downward-curved mandibles.

Wood ibises require extensive marshy areas, but drainage, development, and drought are destroying their feeding grounds and breeding sites. Also, in recent years cold temperatures and winter gales have discouraged nesting attempts in the few remaining colonies.

Brown Pelican

The brown pelican is a comical, ungainly sight familiar to residents and visitors along most of Florida's coats. The state has a relatively stable population of brown pelicans, but recent evidence shows the presence of DDT and its metabolites in the tissues and eggs of pelicans here. Gradual interference with these birds' reproduction, coupled with the destruction of valuable coastal habitat, may push them to rapid extinction. Brown pelicans have already disappeared from wide sections of their former range in other states.

Mangrove trees provide nesting sites for pelicans, and the beginnings of a complicated food web that affects not only pelicans but men.

Pelicans make their 2-foot nests of sticks, grass and reeds during the early summer. They usually lay three white eggs, which hatch in about 30 days. Both parents share in incubation chores.

The real work begins when the young are hatched. The adults will spend most of every day during the next 9 weeks diving into the sea catching fish for the ever-hungry nestlings, each of which will devour approximately 150 pounds of fish during that time. At the end of this period, the immature birds should be able to fly and catch their own meals.

As long as coastal zones are endangered, so will be the wildlife associated with them. The mangrove islands are most important. Water winds in

and out of these thick trees in a maze of channels that regulates and distributes the flow. Nutrients picked up from the land are slowly absorbed by the vegetation, and with leaf-fall or the death and decay of the plants themselves an important food chain starts to develop. Algae and fungi assist in breaking down the plants and provide food for a wide range of aquatic animals.

The countless pools and channels provide the life-support system for many species of juvenile fish and the larval stages of shrimp and other invertebrates that are important both to pelicans and to people.

The brown pelican is a great bird in trouble. It seems unthinkable that man can allow, and perhaps even help, this magnificient animal to fly into oblivion.

Florida Panther

Once distributed throughout the state, and practically the entire North American continent, the panther's range in Florida is now limited to the Everglades, with occasional occurrences elsewhere in the state. In 1967, a panther was illegally killed in the Ocala National Forest, and just last year another was struck down by an automobile near the southern edge of Lake Okeechobee.

Panthers are meateaters. They feed on deer, feral hogs, skunks, rabbits, and an occasional raccoon. Man and predatory animals have never been able to coexist. While Florida continues to develop, these large cats retreat to less land. Panthers enjoy complete protection from being hunted here, but the piecemeal development of wild areas threatens their precarious position. Coming generations may only see live panthers in zoos.

As many as six buffy-colored, black-spotted young are born in February. The kittens weigh about 1-1/4 pounds at birth and are blind for the first 8 or 9 weeks of life. Mortality is high. Only two or three kittens survive to take their first hunting trip, at 3 months of age. The young stay close to momma for about 2 years, at which time the family bonds break. The then-mature panthers begin looking for mates.

Not many of us will ever see a panther in the wild, but the knowledge that we might heightens every outdoor experience. The unexpected adds a dimension of quality to our lives, and anticipating the sight of a wild, free-living Florida panther should make every field trip an adventure.

Okaloosa Darter

Florida's Okaloosa darter is a slender little fish that attains a length of only about 2 inches. It is greenish above and lighter toward its underside, with a few indistinct blotches along its sides.

Not much is known about this tiny member of our fish population. It is one of at least 10 darter species found in Florida, but the range of

the Okaloosa is far more restricted than are the ranges of the others of this group. It is found only in the western panhandle and only in sandy-bottomed streams there. Any dredging, mining, or landfill operation, or any significant increase in water pollution within the Okaloosa darter's range may well mean that Florida has lost another species of wildlife.

The Okaloosa darter is an example of a small, isolated, and seemingly insignificant species of animal that biologists hope to learn more about before it is too late. Perhaps by learning about this creature man can learn more about himself, both as a biological organism and a rational creature who, collectively, controls the fate of many organisms.

Indigo Snake

Snakes are the most misunderstood creatures on earth. Most people hate them, and the few people who love them often love them to death. Such is the case with the indigo snake.

The indigo is a 5- to 6-foot serpent, occasionally longer, that is a shiny, blue-black except for the chin and head, which may be orange-brown.

Even when picked up, indigos seldom attempt to bite, and they become tame almost at once. They will take almost any sort of prey--rabbits, rats, mice, and sometimes other snakes, including the diamondback rattlesnake. (But if indigo snakes are around, rattlesnakes are usually absent.)

Because it often takes shelter in burrows made by the gopher tortoise, the indigo snake is often called "gopher snake," which is not inappropriate because it occasionally preys upon the pocket gopher, or "salamander," in one of its many underground tunnels.

The beautiful indigo snake is a big completely harmless reptile. Only a few remain in the wild. As Florida becomes more populated there are fewer and fewer areas that will support indigo snakes, and snake fanciers have always prized the gentle indigo. Collectors reduced its numbers considerably before Florida placed it on the list of fully protected wildlife species. Many are undoubtedly still smuggled out of Florida, where it is a violation of the law even to catch one or to possess one without a permit from the Game and Fresh Water Fish Commission.

If the indigo snake is to be saved from extinction, there must be cooperation and compliance with the laws which protect it.

Round-tailed Muskrat

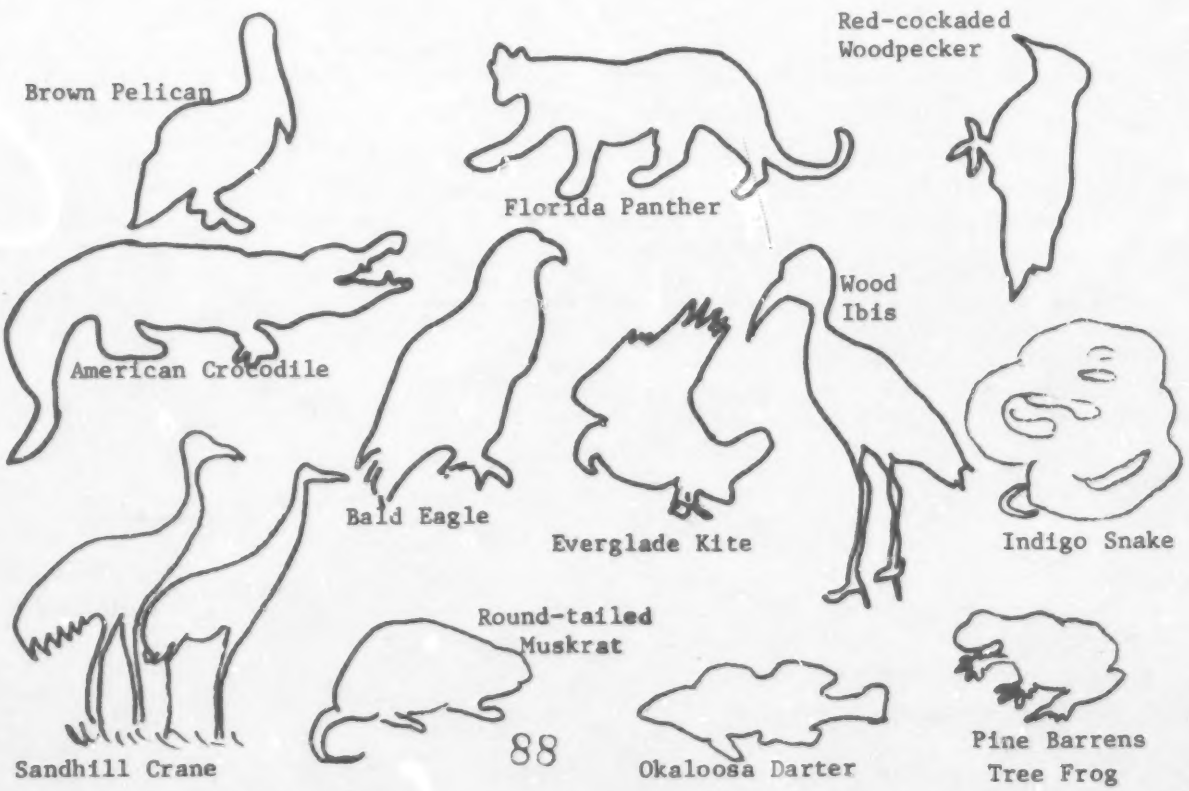
The Florida water rat looks like a small muskrat with a round tail, but this brown rodent seldom gets over 1 foot long. Unlike the northern muskrat, the round-tailed muskrat is at home on land or in the water. Very shy and retiring, it needs marshes to survive, and the combined forces of dredging and drainage have reduced the population to a fraction of its former size.

Our water rat's house resembles a miniature haystack poking above the quiet waters of some marshy cove. The structure usually stands 2 to 3 feet high. It is composed of a mass of tangled vegetation and contains a single room, but always has at least two "doors"--openings into shallow tunnels that lead into the water.

Four to six young rats may be found in the nest at any time of the year, because this species, like most Florida rodents, seems to have several litters each year.

Round-tailed muskrats also construct feeding platforms, where discards from their meals--roots, stems, and crawfish parts--litter the area. Escape tunnels are built in these too, and they have saved many a rat's life. When a barred owl or horned owl swoops overhead, the water rat has only to dive down one of the "hatches" to safety. Otters, minks, and weasels often invade their flimsy homes, and hungry reptiles, like snakes and alligators, take their share of water rats.

The round-tailed muskrat is a valuable link in many food chains. Indiscriminate drainage and the conversion of wetlands for agriculture have reduced the habitat needed for this interesting creature to survive. Few people see this nocturnal rodent, and few care to. Roundtails are not particularly attractive, nor are they well understood. But just the same, wouldn't it be sad to push this member of our wildlife community into extinction when it is within our power to aid it instead?



Red-cockaded Woodpecker

Named for the small red ear patch, or cockade, of the adult male, this robin-sized woodpecker's best field marks are the pure white cheeks and the black-and-white "ladder" on its back. The red-cockaded's nasal-toned call notes help locate this wary bird as it continues its incessant search for food--insect larvae (particularly of wood-boring insects), ants, various spiders and caterpillars, and an occasional wild fruit or berry.

This woodpecker avoids man and his activities. It needs large, old pine trees in open stands for its home, and it nests only in those trees with rotting heart wood. Through some unerring instinct the red-cockaded woodpecker detects trees having soft, rotting interiors. Then it drills through solid, living wood into the diseased heart wood and excavates the nest cavity. Three or four eggs are the normal clutch.

The red-cockaded clan are gregarious. As many as 10 nests have been found in a single tree. The woodpeckers will use the same nesting holes each year as long as the gum runs freely from the living pine. But when the tree dies and the gum ceases to flow, the birds abandon that tree and look for another one.

Few old-stand pine forests are left in Florida, and the rows and rows of planted pines will never take their place. With the increase in forest management, diseased trees are quickly removed, and, of course, planted pines are cropped before they reach the size and maturity required by the endangered red-cockaded woodpecker.

Encouraging landowners to preserve the few remaining tracts of old pines will help the red-cockaded maintain its teetering existence in Florida.

American Crocodile

In earlier times, crocodiles ranged up the Florida east coast to the Daytona Beach area, but now they are restricted to the southern tip of the peninsula and the Keys. Crocodiles are neither beautiful nor friendly. In fact, they appear ugly, vicious, and stupid. Yet they have a significant role in maintaining the environment on which many other wild creatures depend.

Crocodiles inhabit salt bays and mangrove-bordered estuaries but take occasional trips into the open sea. Unrestricted market hunting for both alligators and crocodiles in the early part of the century decimated the crocodile population to the point that it has never recovered. Now, despite complete protection for this huge reptile, the development of coastal areas for human use further reduces its habitat.

Secretive, unpredictable, wide-ranging where it exists, and unsociable, crocodile populations were probably never large, and to survive, those that remain continue to withdraw before the pressures of civilization. Unfortunately, the crocodile does not respond to management like his cousin, the alligator, which thrives in fresh water.

Looking at the crocodile is a way of looking back into the Age of Dinosaurs. These largest and most aggressive of modern reptiles give man a faint idea of what the dominant animals of an earlier era may have looked like in the flesh.

Hopefully, we can continue to share part of the environment with a creature whose ancestors roamed the earth 200 million years ago.

Sandhill Crane

Two races of sandhill cranes occur in Florida, the Greater Sandhill, a winter visitor, and the Florida Sandhill, which lives and breeds here. Both are declining because of the conversion of wet prairies to agriculture, the destruction of nesting Habitat, and man's invasion of wilderness areas.

Cranes nest after a spectacular courtship ceremony that includes musical trumpetings and an intricate dance. They lay only two eggs, pale brown or olive in color, and usually only one young bird survives. Steady production of young depends on good weather, low predation, and privacy. Cranes are wary birds; they only feel safe in areas where they can see danger approach, hence their preference for wetlands that provide wide open spaces. The wetlands produce their food, too, for which they probe with their long, sharp bills.

The Florida Sandhill's diet is a varied one, including not only succulent roots, bulbs, and grains, but also insects, crawfish, lizards, frogs and snakes.

The spacious wet prairies and marshes of central Florida--Paynes Prairie, the Kissimmee River valley, the Fisheating Creek flood plain, and portions of the Everglades--still provide the habitat sandhill cranes need for survival. Whether or not these great, graceful, noisy, dancing birds remain with us depends on how closely we guard our remaining wetlands against further encroachment.

Bald Eagle

Today, only Florida and Alaska report even fair bald eagle reproduction. The sinister effects of chemical pesticides and loss of nesting trees are dooming the King of Birds.

Florida eagles usually lay two eggs, in early winter. Incubation, shared by both sexes, takes about 35 days. Care of the slow-developing young requires approximately 6 months, so April or May finds the brown, immature birds making their first flights. Summertime is travel time for most Florida eagles. Even the young of the year have been found 1,600 miles from "home."

Fish make up the bulk of the bald eagle's diet, but he's not above scavenging for road-killed animals, or even in garbage dumps. On more than one occasion eagles have been seen taking food from smaller predaceous birds, like the osprey.

Despite laws against shooting or capturing eagles, each year thoughtless persons kill or maim bald eagles by shooting. This is certainly more dramatic than the gradual poisoning to which they are subjected from a DDT-laden food chain, and habitat destruction--but it is all three in combination that endanger the national emblem of the United States.

Since ancient times, the eagle has been regarded as an emblem of might and courage. Poets have been inspired by the bird's great power of vision, its dignified manner, its vast, soaring flight, and the wild grandeur of its abode. The bald eagle appears on currency, coins, uniform buttons, medals, public documents, stamps, and the Great Seal of the United States. But how much longer will it appear, free and untamed, in the sky?

Everglade Kite

Everglade kites were once found over most of central and southern Florida's fresh water marshes. As channelization and drainage projects reduced this habitat, the kites became restricted to the Everglades region. Today, with peninsular Florida's "drought-and-drown" weather patterns, and man's interference with the natural, historical water flow, the remnant population of Everglade kites continues to dwindle.

Kite's nests, of twigs and leafy sticks, are located on bushes and small trees above the marsh. They usually contain two dull white eggs well marked with brown. Like the young of most raptors, baby kites are slow to develop, so they spend considerable time in the nest. A pair of kites raises only one family a year, and if the nests are disturbed in any way the parent birds may abandon the area.

To their disadvantage, kites are overspecialized birds of prey. They feed almost exclusively on the apple snail, and the availability of snails is directly dependent upon the number and size of the fresh water marshes that support them. The quality of the water is also important. Restricting the amount of habitat available to Everglade kites necessarily limits the number of breeding pairs because they are highly territorial.

Fires, heavy rainfall, and natural predation also make inroads into the Everglade kite population. And occasionally, an insensitive or uncaring person breaks federal and state laws by killing one of these rare and truly magnificient birds.

Kites represent a real challenge to wildlife conservationists, for here is an animal that evolution may have condemned to extinction, and man has helped along. The question now is whether Floridans will share with this creature enough space to allow for its continued existence.

Summary

Many more species of Florida wildlife are rare or endangered and fully protected by law. Included are the Florida weasel, Everglades mink, Key Largo wood rat, Ivory-billed woodpecker, dusky seaside sparrow, Cape Sable sparrow, great white heron, reddish egret, roseate spoonbill, mangrove cuckoo, and the Florida scrub jay.

There are probably other endangered species that have not been listed because they have not been studied enough to know how many there are or with what problems they are faced.

Florida's private and public agencies are committed to make every reasonable effort to help endangered species remain wild and free on Spaceship Earth. These efforts are aimed at providing for the animals' basic needs and offering protection under state and federal laws.

The Florida Game and Fresh Water Fish Commission, the Department of Natural Resources, and the Division of Forestry of the Department of Agriculture provide protection and habitat management that favor certain animal species. The Department of Pollution Control and the Trustees of the Internal Improvement Trust Fund are also actively involved in protecting Florida's wildlife resources and the habitat on which endangered species depend.

Sure Florida is changing. Everything and everybody is constantly undergoing change. But if you have looked around, you'll agree that our wildlife is indeed trying to tell us something. Are we willing to listen? If we have the will, knowledge, and prudence to act promptly and vigorously to help cure earth's environmental ills, the trends we see can be reversed. Wildlife that is threatened by pollution, the destruction of essential habitat, and wholesale degradation of the environment for temporary gain, can be saved.

Man must develop the intellectual humility that allows him--compels him--to share the land, water, and air with a myriad of other creatures that are important to his own survival. By saving wildlife, man can save himself.

APPENDIX B

SAVING THE RED-COCKADED WOODPECKER[7]
The Sandhills Game Land Approach
By George E. Smith

Curtis fitted the telphoto lens to his camera and pointed it towards a small cavity about 40 feet up the trunk of a nearby longleaf pine. He then settled down and waited motionless, for the red-cockaded woodpecker which had hastily departed a few moments earlier. We soon heard a chattering sound as the bird announced its presence.

I watched, about 50 yards away, as the small, black and white woodpecker made short flights from tree to tree. It circled the "home" tree a few times and then finally settled into position in the tip of a broken-topped pine directly behind the photographer. From where I stood, it made quite a picture as Curtis watched for the bird, unaware that the bird was watching him. He was hoping for a quick snapshot, but the woodpecker was only interested in a gracious departure by this intruder.

It was a standoff for awhile until Curtis finally retreated from his position and walked over to where I was standing. "My camera got a little heavy," he offered, obviously a little disappointed. "Yeah," I said, "Look behind you; our bird just returned home." We watched as the red-cockaded moved up and down the old longleaf pine, making a thorough inspection to be sure all was well.

This little episode took place on one of my recent trips to the Sandhills Game Land. Curtis Wooten and Luther Partin, with the Commission's Division of Education, went along to photograph some of the endangered species management activities presently being carried out on this area.

Most readers of Wildlife in North Carolina are well aware of the present endangered status of this species of woodpecker (see "Saving the Red-cockaded Woodpecker" November 1975). Cooperative efforts are now in progress throughout the southeastern United States in an effort to improve the lot of this small, non-game bird. The North Carolina Wildlife Resources Commission has taken an active role in this endeavor. One important step has been to implement a program for habitat protection and improvement on Game Land areas where the woodpecker now exists. The Sandhills Game Land is where most of this work is being accomplished and provides a good example of how proper habitat management can improve the prospect of having the red-cockaded woodpecker with us for a long time to come.

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[7]Smith, George E., "Saving the Red-cockaded Woodpecker," Wildlife in North Carolina, July, 1976 pp. 16-18.

A general familiarity with some of the bird's unique biological requirements is essential in understanding some of the management practices which will be described later. Let's look at a few of the more important aspects of the biology of this species.

The mature pine forest of the southeastern United States is home for the red-cockaded woodpecker (Dendrocopos borealis). It now exists in reduced numbers due to lumbering and general urbanization in most of the southeast. In North Carolina, the Sandhills region offers the best remaining habitat due to fairly extensive stands of preferred, old-growth longleaf pine. Cavities are usually constructed in trees at least 60 years of age and are more likely to occur in older trees (Hopkins and Lynn, 1971).

Life centers around the cavity tree--trees in which cavities are excavated and utilized for roosting and nesting during the life of a colony (1). Nesting occurs each year in April through June. One unique feature is the bird's preoccupation with "resin chipping" around the cavity opening. This practice results in a sticky, thick resinous material which is exuded by the surface layers of tree tissue. It is thought that chipping is primarily done to deter predators such as snakes and flying squirrels from entering the cavity (Dennis, 1971).

It might take anywhere from a few months to several years to construct a cavity that can be used (Carter, 1974). If these trees are indiscriminately harvested in logging operations or lost to natural causes over a short period of time, woodpeckers occupying the site will most likely perish. Therefore, land management practices must insure the protection of cavity trees and provide for a continuing supply of "potential" replacement trees within the range of each colony. By way of explanation, the colony is not a group of birds, but rather, is an area of roost, nest and start cavities used by an associated group of birds called a clan. The clan functions together in the rearing of young and is made up of a mated pair, offspring and various halpers (1).

Food is another factor which must be considered. The red-cockaded woodpecker feeds on a variety of insects, but spiders, centipedes and various types of mast are also utilized (Baker, 1971). Adequate feeding areas must be available and be in close proximity to each colony site. These areas are generally made up of stands of pine trees--the older, the better--adjacent to the colony. While colony sites range in size of from one-half to five acres (with two to five or more cavity trees), the feeding area is much larger. The required area varies according to the colony size, the age of the forest and even the site productivity (Thompson and Baker, 1971). These areas are usually managed as support stands with the idea of providing areas for colony expansion. On the Sandhills Game Land, a minimum of 40 acres of support area is assigned each colony.

With these basic facts in mind, we are now ready to explore means for helping the bird through habitat improvement. On the Sandhills, special management practices have been applied in an orderly, step by step approach. The first logical step is simply locating the colony sites. Wildlife management technicians have been surveying each timber unit in an effort to locate

cavity trees which determine these key sites. It is essential to identify these locations prior to planning activities such as logging and prescribed burning. After these trees are located and recorded on maps for future reference, they are marked with a band of white paint to prevent accidental cutting or damage. Approximately 80 colonies have been located and recorded thus far, and a total of 357 cavity trees have been marked.

Each cavity tree is further "enhanced" for long term use by red-cockaded woodpeckers through the removal of all understory vegetation within a 20-foot radius of the tree. The purpose of this somewhat odd procedure is to create a condition which the bird prefers--an open understory with no obstruction near the cavity. Brush competition eventually results in abandonment of the tree or the construction of a new cavity above the brush line. The Sandhills prescribed burning program is being used as an aid to reduce this unwanted competition within the colony site. Burning is accomplished on a rotation basis throughout the pine forest land and is carried out during the winter months. Damage to standing timber is minimal during this season. Leaf litter and other combustible materials are removed from around each cavity tree to prevent the thick resinous layer from igniting and possibly causing heat damage to the tree. Since the red-cockaded woodpecker is a fire adapted species, burning, when properly applied, poses no problem to the birds in the colony site.

Modifications in the Sandhills Game Land timber cutting program have been initiated to protect these key areas already mentioned. For example, marking guidelines provide that no cavity tree is to be marked for sale. Sufficient potential trees within the colony site and in surrounding support stands are left for as long as the colony area exists. Timber sale agreements include a provision preventing any actvity relating to the logging job from being carried on within colony areas during the nesting season. Little harvesting will be done within colony sites or support areas with the exception of an occasional thinning if needed to keep the stand in an open condition.

Finally, a comprehensive Sandhills forest management plan is now in the final stages of completion which will give the red-cockaded a better chance for survival in the future. The overall purpose is to plan now for replacement stands which will be available to the woodpeckers as present stands of trees are eventually lost through natural causes--fire, disease, etc. These stands will be managed as even-aged sites and will be large enough to support populations of this bird.

One question remains--will the game and forestry benefits, which have been a valuable part of the Sandhills Game Land for a long time under Commission management, be diminished as the bird's future is insured? We feel that one of the major objectives, from the production of game for the enjoyment of the hunter to the growing of timber for marketing, can be accomplished without major conflict in the endeavor to save this endangered species. At the present time approximately eight percent of the total Game Land area, including support stands, is being utilized by this bird. Practically no game management compromises have been made on these sites. In

In fact, most practices which benefit the red-cockaded also benefit the game species managed here. Some timber production will obviously be lost as stands are carried past maturity. However, the "lost" volume will be relatively small compared with the total production of the forest on this area. At any rate, this time and effort will be well worth the cost if just one of the many species of wildlife, now on the endangered list, is saved from the brink.

Oh yes, Curtis finally got all the snapshots he wanted, but we had to find a more cooperative clan of red-cockaded woodpeckers.

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